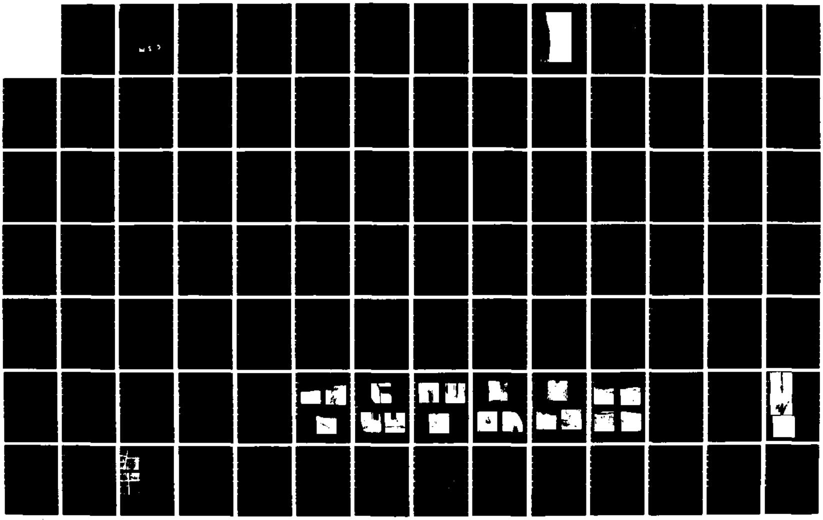
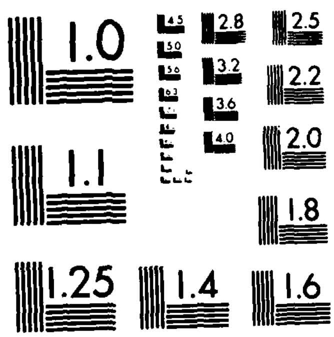
AD-A144 060 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SAVILLE DAM (CT 00376..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV SEP 78 1/2

UNCLASSIFIED F/G 13/13 NL




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

AD-A144 060

FARMINGTON RIVER BASIN
BARKHAMSTED, CONNECTICUT

SAVILLE DAM
CT. 00376

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

SEPTEMBER 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00376	2. GOVT ACCESSION NO. A144 060	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Saville Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE September 1978
		13. NUMBER OF PAGES 90
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Farmington River Basin

Barkhamsted, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Saville Dam is an earth embankment with a concrete core that is 1,950 ft. long and 135 feet high. It has an emergency spillway and three diversion conduits. The dam and its appurtenant structures are in good condition. The project will not pass the Probable Maximum Flood without overtopping the dam. However, the spillway capacity is not judged seriously inadequate as the project will pass approximately 90 percent of the PMF before the dam is overtopped.

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification Number:	CT 00376
Name:	Saville Dam
Town:	Barkhamsted
County and State:	*Litchfield* County, Connecticut
Stream:	East Branch of the Farmington River
Date of Inspection:	May 25, 1978

BRIEF ASSESSMENT

The Saville Dam is an earth embankment with a concrete core that is 1,950 feet long and 135 feet high. It has an emergency spillway and three diversion conduits. The dam and its appurtenant structures are in good condition.

The project will not pass the Probable Maximum Flood (PMF) (Recommended Spillway Design Flood) without overtopping the dam. However, the spillway capacity is not judged seriously inadequate as the project will pass approximately 90 percent of the PMF before the dam is overtopped. The spillway can pass the PMF if a 200 foot section of the eastern portion of the dam is sandbagged. This condition is known by the engineering staff of the Metropolitan District.

Some recommended measures to be undertaken by the onwer include establishing metering points for seepage measurement and repairs to the upper gate house bridge. It is not urgent to implement these recommendations. However, it is recommended that the owner implement them within two to three years after receipt of this Phase I Inspection Report.

Joseph F. Merluzzo	Richard F. Lyon
Connecticut P.E. #7639	Connecticut P.E. #8443
Project Manager	Project Engineer

PREFACE

This report is prepared under quidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface evaluations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify the need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

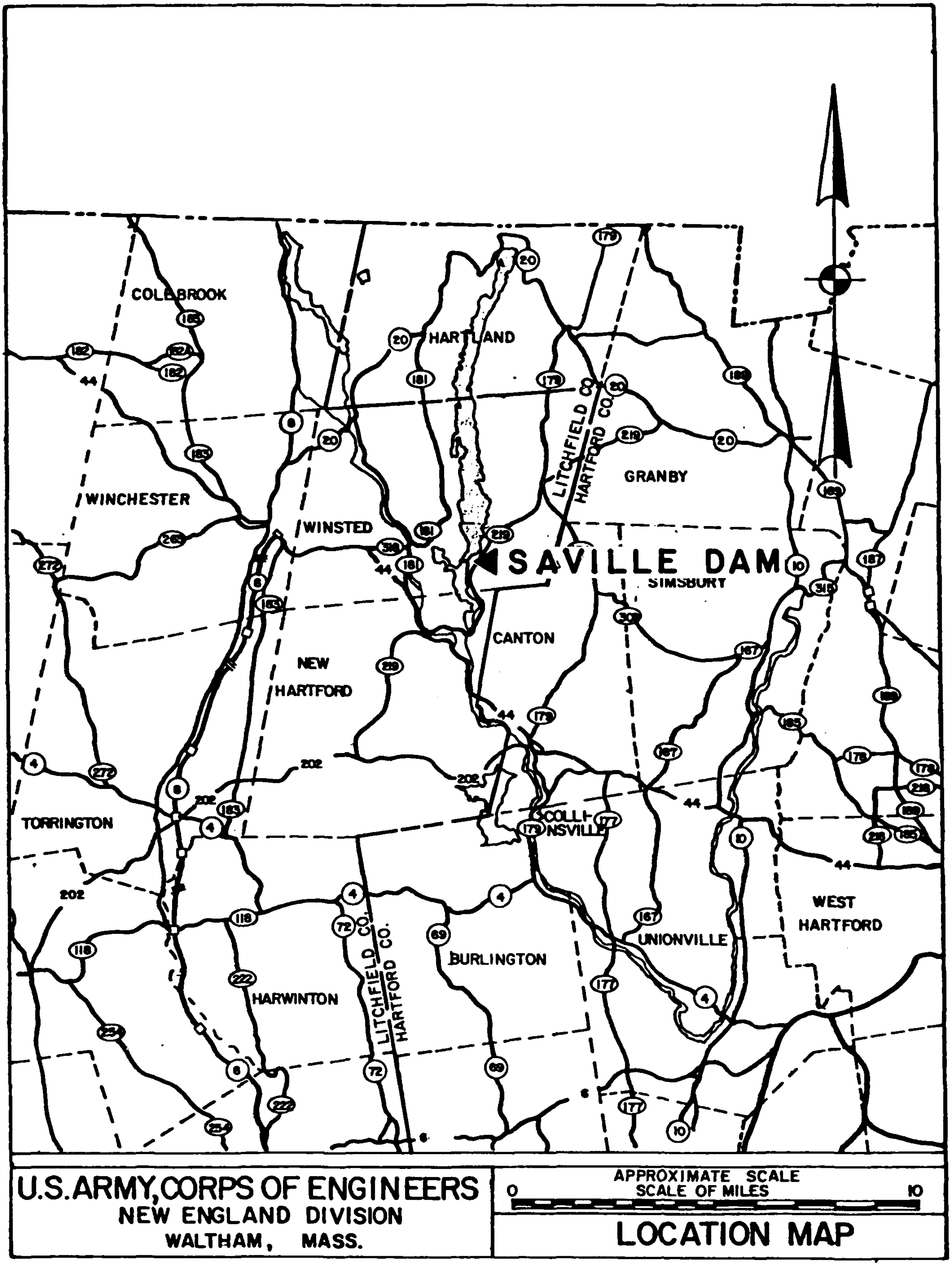
Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and varity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

APPENDIX MATERIALS

OVERVIEW PHOTO - SAVILLE DAM (BARKHAMSTED)


COLEBROOK
HARTLAND
WINCHESTER
WINSTED
GRANBY
LITCHFIELD CO.
HARTFORD CO.
SAVILLE DAM
SIMSBURY
CANTON
NEW HARTFORD
TORRINGTON
COLLINSVILLE
HARWINTON
BURLINGTON
UNIONVILLE
WEST HARTFORD
U.S. ARMY, CORPS OF ENGINEERS
NEW ENGLAND DIVISION
WALTHAM, MASS.
APPROXIMATE SCALE
SCALE OF MILES
0
10
LOCATION MAP

PHASE I INSPECTION REPORT

SAVILLE DAM CT 00376

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Storch Engineers has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Storch Engineers under a letter of May 3, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0000 has been assigned by the Corps of Engineers for this work.

b. Purpose -

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly, effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

The Saville Dam is one of 18 dams owned and operated by the Metropolitan District of Hartford County, Connecticut. The structure is an earth embankment with a concrete core wall. The overall length and height of the dam is 1,[illegible] feet and 135 feet (Appendix B, Plate 1). It has an e[illegible]gency spillway and channel, upper and lower gate houses and service tunnel. The facility impounds the Barkhamsted Reservoir and serves as the primary source of drinking water for the greater Hartford area. The dam is located in the Town of Barkhamsted, Litchfield County, Connecticut (See Location Map) on the East Branch of the Farmington River and just upstream from Richard's Corner Dam.

The size classification of the dam is large (135 feet high and 113,000 acre feet of storage) and the hazard classification is high per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers. The immediate downstream area that will

be affected by the dam's failure as shown on Appendix D, Plates 6 and 7 includes parts of New Hartford, Collinsville and Unionville as well as numerous homes and farms outside these communities

The Saville Dam was designed by the Engineering Section of the Metropolitan District under the direction of Caleb M. Saville, Chief Engineer. Several consultants such as Karl Terzaghi, Charles Berkey, C.M. Allen, J. Waldo Smith and Frank Winsor were retained as experts for the design. Model tests of the spillway and channel were performed in 1935 and 1937 by the Alden Hydraulic Laboratory of the Worcester Polytechnic Institute (Appendix B, References 5, 6, and 7). When the flood of August, 1955 caused considerable damage to the lower part of the spillway channel, channel repairs were made and a new model test was conducted in 1956 by the Alden Laboratory to verify the adequacy of the spillway and its channel (Appendix B, Reference 10).

The dam was constructed between the years 1933 and 1940 by the C & R Construction Company, Boston, Massachusetts and B. Perini & Sons, Framingham, Massachusetts (Appendix B, References 1, 2 and 3).

There is a regular staff of maintenance personnel available. The items that are scheduled for regular maintenance include the cutting of grass on the embankment of the dam,

servicing of the upper and lower gate house equipment and inspection of the service tunnel.

The person in charge of day to day operation of the dam is Irv Hart, MDC Supply Division Headquarters, Beach Rock Road, Barkhamsted, Connecticut; Telephone Number: 379-0938.

1.3 Pertinent Data

a. Drainage Area - The 53.8 square mile drainage area that surrounds the Barkhamsted Reservoir is a fairly tight and responsive watershed. The terrain is steep and forested with very little development.

b. Discharge at Damsite - Maximum known flood discharge at the spillway is 11,450 cfs at elevation 536.25, (August, 1955).

(1) Outlet Works - three, 54 inch diameter conduits at invert elevation 420.3 ±.

(2) Maximum known flood at damsite 11,450 cfs.

(3) Ungated spillway capacity at maximum pool elevation 22,200 cfs at 545.0 elevation.

(4) Gated spillway capacity at pool elevation N/A cfs at N/A elevation.

(5) Gated spillway capacity at maximum pool elevation N/A cfs at N/A elevation.

(6) Total spillway capacity at maximum pool elevation 22,200 cfs at 545.0 elevation.

c. Elevation (Feet above MSL)

(1) Top of Dam: 549.0

(2) Maximum pool-design surcharge (MDC):537.5

(3) Full flood-control pool: N/A

(4) Recreation pool: N/A

(5) Spillway crest: 530.0

(6) Upstream portal invert diversion tunnel: 420.0

(7) Streambed at centerline of dam: 410.0

(8) Maximum tailwater: 427.0 ±

d. Reservoir

(1) Length of maximum pool: 45,600 feet ±

(2) Length of recreation pool: N/A

(3) Length of flood-control pool: N/A

e. Storage (Acre-Feet)

(1) Recreation pool: N/A

(2) Flood-control pool: N/A

(3) Design surcharge (MDC): 113,000 ±

(4) Top of dam: 144,000 ±

f. Reservoir Surface (Acres)

(1) Top of dam: 2,770 ±

(2) Maximum pool: 2,700 ±

(3) Flood-control pool: N/A

(4) Recreation pool: N/A

(5) Spillway crest: 2,270 ±

g. Dam

(1) Type: Earth Embankment with concrete core wall

(2) Length: 1,950 feet ±

(3) Height: 135 feet ±

(4) Top width: 85 feet ±

(5) Side Slopes: Varies; upstream - 1:4 to 1:1.4
downstream - 1:3 to 1:1.7

(6) Zoning: See cross section, Appendix B, Plate 2.

(7) Impervious Core: Concrete

(8) Cutoff: Not less then six feet

(9) Grout curtain: 20 to 25 feet ±

(10) Other: N/A

h. Diversion and Regulating Tunnel (Appendix C, Photo 7)

(1) Type: Concrete

(2) Length: 330 feet ±

(3) Closure: Not applicable

(4) Access: Upper and lower gate houses

(5) Regulating Facilities: Electrically operated gates for 3-54 inch pipes

i. Spillway

(1) Type: Granite block lined fixed weir

(2) Length of Weir: 200 feet

(3) Crest elevation: 530 feet

(4) Gates: None

(5) U/S Channel: Earth approach underwater 5 feet

(6) D/S Channel: 322 feet granite rubble masonry and 416 feet rock lined channel

(7) General: N/A

j. Regulating Outlets

Regulating Outlets consists of three, 54 inch diameter pipes. Two are for water supply and one discharges into a downstream channel.

(1) Invert: U/S - Elevation 420.3
D/S - Elevation 416.54

(2) Size: three, 54 inch pipes

(3) Description: steel pipe

(4) Control mechanism: electrically operated gates

(5) Other: N/A

SECTION 2 - ENGINEERING DATA

2.1 Design

The dam was designed by the Metropolitan District in conjunction with several well-known experts in the fields of geology, soils and hydraulics. In addition to the expertise, provided by these consultants, there have been a number of studies performed before, during and after the completion of construction in 1940.

During the design phase, the "state of the art" for stability analysis was to utilize the experience of other similar designs. Geotechnical investigations were directed towards the suitability of the existing subsurface strata at the dam site.

Dr. Terzaghi's 1929 report recommended certain slopes for the body of the dam and construction methods for the core wall and earth embankment. Mr. Charles P. Berkey's 1931 report indicated that the crystalline rock at the core wall foundation "will give excellent support and is essentially tight". The site was evaluated several different times before construction and the final recommendations were very positive concerning the physical and geologic features of

this site. The geological recommendations for this dam called for a core wall throughout the body of the dam, which was to be excavated for and seated into the rock floor to insure a sound foundation.

Model tests on the spillway and spillway channel were performed in 1935 and 1937 by the Alden Hydraulic Laboratory (Appendix B, References 5, 6 and 7). These model tests were conducted to calibrate the spillway and obtain water surface profiles for various floods as well as the maximum flood. After considerable damage to the lower portion of the spillway channel during the flood of August, 1955, a model test was completed in 1956 (Appendix B, Reference 10) to find a stablized outlet channel and pool to prevent scour during all floods up to the design capacity of the original channel. Reconstruction of the spillway has since been completed and is operating satisfactorily.

2.2 Construction

The dam was constructed between the years 1933 and 1940 under three contracts. The first by C & R Construction Company, Boston, Massachusetts was to construct the stream control works and the lower portion of the earth dam. The second and third contracts, by B. Perini & Sons, Framingham,

Massachusetts were to complete the upper and lower gate houses, complete the core wall and embankment, construct the spillway weir and channel, install service gates, valves, and pipes and complete all unfinished items to make the reservoir ready for operation.

Conversations with some of the personnel who were present during the construction phase of the dam, led to a conclusion that an extraordinary amount of care was taken to insure a tight seal for the core wall both during the excavation of ledge for the seating and in the core wall construction itself. During the core wall construction, all pours had to be completed in the specified time and without stopping. If the quality of the concrete was suspect, the section was removed and repoured. All construction was inspected under the direction of the Metropolitan District Commission.

2.3 Operation

This dam has to be operated only because of its function as a water supply facility and, therefore, the water level is kept to a maximum. The operation records for the water level are monitored at the headquarters of the Metropolitan District.

The screens for the intake channel are maintained and changed on a regular basis but are for the sole purpose of water quality.

Regulation of this water supply is through stop log gates and sluice gates in the upper gate house as well as discharge gate valves in the lower gate house. Water flow in the conduits is measured by recording venturi meter tube sections located midway in the service tunnel.

The method of operation is basically manual requiring personnel attendance as needed to accommodate changing conditions or flow regulation. Manual operations are assisted by means of motor operators on the valves and an electrically operated bridge crane.

2.4 Evaluation

a. Availability - Design, construction and operation information was readily available. The one area which was lacking in terms of design information was for embankment slope stability. As was previously discussed, methods available during the design period were limited.

b. Adequacy - The information made available for this inspection along with the visual inspection, past performance history and hydrologic and hydraulic assumptions were more than adequate to assess the condition of the dam.

c. Validity - The information made available is not questionable and the history of this dam seems to bear this out.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General - The visual inspection of the dam was conducted on May 25, 1978 by members of the engineering staff of Storch Engineers with the help of Peter Revill and Richard Allen of the Metropolitan District. A copy of the visual inspection check list is contained in the Appendix.

The following procedure was used for the inspection:

1. An examination of the top and side slopes of the dam, appurtenant structures and their parts;
2. A survey of the banks in the downstream area;
3. An inspection of the upstream surfaces of the dam, outside of gate house and weir, as well as the banks of the reservoir by boat;
4. A level survey of the dam crest;
5. A measurement of seepage discharges using calibrated containers and stop-watch;
6. A measurement of the temperature of seepage water, water in the reservoir and water downstream;
7. Sketches or notes of the areas that show evidence of leaking, leaching or damage;

8. Photographs of the general view of the dam and its appurtenant structures, (Appendix C).

Before the inspection, the design, construction, operation and maintenance documentation, results of repair and prior inspections were compiled and studied. A compact sketch of the main structure was used for a fast orientation during the period of inspection (Appendix B, Plate 1).

In general, the overall appearance and condition of the dam and appurtenant sturctures is good.

b. Dam - The downstream face of the dam was inspected for evidence of seepage through the body of the dam. The sloped face of the dam has three berms which serve to collect the surface runoff.

The body of the dam has a drainage system (Appendix B, Plate 2) consisting of tile pipes 8 inches to 10 inches in diameter and catch basins on the berms to collect the surface and seepage flows. A check of the outlet of each drain showed that all drains were dry, except one which is near the toe at the western end of the dam (Appendix C, Photo 9). Measurement of the seepage discharge from this outlet was approximately 2 to 3 gal/min.

Once in recent years a catch basin at the lower level backed-up and there was some fear that silt had blocked an internal drain of the body of the dam. A visual check by

maintenance personnel showed nothing but because of this problem, the Metropolitan District has developed plans which will separate the surface drainage system from the internal drain system.

The downstream slope of the crest of the dam has a shrubbery type of ground cover which was planted because the slope was too steep (1.7:1) to be safely mowed. The removal of this shrubbery, planting of grass and the use of grazing animals for maintenance are plans that are now being implemented.

The level survey of the crest of the dam did not reveal any differential settlement. A careful visual survey of the face of the dam showed no detectable bulges or movement of the embankment. The condition of the spillway, the upstream riprap of the dam, the exterior of the gate house and the adjacent reservoir areas were inspected by boat and are discussed in paragraphs c, d and e below.

c. Appurtenant Structures - The upper gate house contains the operators for the sluice gates and emergency power equipment. Near the bottom of the gate house there are a number of places where there is evidence of seepage and efflorescence. The upper gate house is structurally sound and the equipment is in good condition, although it is old.

There is a steady flow of moisture through the expansion joints of the service tunnel (Appendix C, Photo 8). The concrete of the service tunnel is generally in good condition. At the joint between the core wall and the service tunnel, there is a flow of moisture. There have been a few attempts to seal this area by means of pressure grouting and several different types of epoxy grout. These methods have had only limited success but the flow is not heavy and does not appear to have changed over the years. A pipe that penetrates the wall of the service tunnel near the lower gate house (Appendix C, Photo 10), supposedly carries the flow of a spring in this area. The service tunnel contains three, 54 inch diameter pipes (Appendix C, Photo 7), two of which supply water to the Hartford area and the third one goes to the overflow basin which is located at the foot of the dam.

A visual survey of the dam crest showed the structures and reservoir banks to be in good condition except for the upper gate house bridge. The bridge has experienced some settlement and the columns of this bridge above elevation 530.00 feet have a considerable number of cracks in the mortar joints between the granite blocks, as well as in the blocks themselves.

In the area of the upper gate house, there was some settlement observed of the parapet type walls at the approach to the gate house.

A moisture problem in the upper and lower gate houses and the service tunnel prompted the installation of a dehumidification system.

d. Reservoir Area - An inspection of the upstream reservoir area by boat showed that the riprap is in satisfactory condition with no evidence of shifting or repair (Appendix C, Photo 5). The area immediately upstream of the dam embankment seem to be in a very natural state with no visible signs of erosion, sloughing or distress.

e. Downstream Channel - The spillway and downstream channel are cut into ledge rock (Appendix C, Photos 3 and 4) and are in good condition. There is no visible erosion or sloughing of the floor or walls.

At the time of the 1955 flood, the lower part of the channel was washed away. In May, 1956, a study done by Alden Hydraulic Laboratory which checked the capability of the repaired spillway channel. The present condition of the channel seems to be very good.

3.2 Evaluation

The visual inspection of this facility did not reveal any apparent areas of distress. The general condition of the dam is good. Although there was some seepage found coming from a drainage pipe of the toe of the dam this is considered normal for a dam of this size.

Overall, the appurtenant structures are in good condition with some minor flaws such as cracks in the bridge to the upper gate house and seepage through the construction joints in the service tunnel.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

The responsibility for maintenance is with the Metropolitan District Commission. The maintenance staff and police force is headquartered in a building located approximately 1/2 mile northwest of the dam. These personnel perform the necessary work needed to patrol the area for trespassers, mow the grass of the slopes and maintain the water supply equipment and drainage system of the dam.

There is no written standard operating procedure or emergency operating instructions for this dam.

4.2 Maintenance of the Dam

Maintenance of the dam is very consistant for items such as mentioned above. The project for the separation of the underdrain and surface water system that is described in Section 7 is part of the Metropolitan District's continuing maintenance program. In the event of a PMF, it would be necessary to sandbag the east end of this dam, however, there seems to exist nothing more than an understanding that this would be necessary.

4.3 Maintenance of Operating Facilities

The overall maintenance of all the mechanical and electrical components of the Saville Dam facilities which could be observed appeared to be good. Some corrosion was observed on the bolts and flanges of the 48 inch diameter piping located in the lower gate house.

Ventilation and high humidity appears to be an inherent problem in the lower levels of the two gate houses and the service tunnel. As a result, corrosion has damaged much of the electrical wiring at the lower levels. The things that have been done to combat this damage have been to install an open wiring system (no electrical conduits) and a dehumidification system. At the time of inspection, it was noted that electrical power to the operating facilities was by outside purchased power. A diesel powered emergency generator is located in the upper gate house which is periodically cycled for testing and a 40 year old hydraulic turbine generator is located in the lower gate house.

In addition, it was noted that metal deformation or ball-peening is evident in the upper end of the stop log guide rails located in the stairwell of the upper gate house.

4.4 Description of Warning System

The only warning system is a reservoir level monitor which records the pond elevations only. This instrumentation is located at the dam, with transmitting capabilities to the Metropolitan District Field Headquarters, 1/2 mile from the dam. There is no warning system to local police or civil preparedness authorities.

4.5 Evaluation

In spite of the lack of modern updated equipment for the emergency power system and modern valves and operators for the water system, the safety of the dam does not appear jeopardized. The capacity of the spillway precludes the hydraulic need for the service tunnel to exist. The existence of the emergency system is necessary only for the purpose of water supply.

Although the evaluation of the mechanical and electrical equipment did not indicate any deficiencies which would jeopardize the structure's integrity, we did assemble a "punch list" of electrical flaws which should be corrected to conform to the electrical code. This list will be available to the Metropolitan District Commission to use as they may see fit.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data - The 200 foot long spillway and three, 54 inch pipes in the service tunnel are the only means of transmitting water past the dam. As stated in Section 2, three separate model tests were conducted on the spillway in 1935, 1937 and 1956. These tests gave important data to the designers concerning the characteristics of the spillway and determined its behavior during the design flood (15,300 cfs, elevation 537.5).

A review of the calculations by the MDC indicates that the spillway is capable of passing the PMF, however, a 200 foot section of the dam crest must be sandbagged to elevation 546.5 or 18 inches. This represents an inflow of 78,900 cfs and a routed outflow of 24,200 cfs. The spillway capacity just before overtopping is 21,500 cfs or 89 percent of the PMF. Using the guide curves supplied by the Corps of Engineers (mountainous terrain), the PMF inflow into the reservoir is 75,320 cfs (1,400 cfs/SM x 53.8 SM). This flow is less than that used by the MDC to calculate the PMF (see Appendix B).

b. Experience Data - The maximum flood to date at the Saville Dam was the flood of August, 1955. During this

flood, the discharge was 11,450 cfs and the depth of water over the spillway was 6.25 feet, 1.25 feet below the MDC's design depth of 7.5 feet. According to observations at the time of the flood, the spillway and upper channel performed adequately. The lower channel and pool, however, suffered damage and had to be reconstructed.

c. Visual Observations - The spillway and channel at the time of the inspection were in good condition. There are presently plans by the Metropolitan District to regrout the joints in the granite lined portion of the spillway and channel.

The three, 54 inch pipes in the service tunnel can be fully opened in the event of an emergency. The pipes are all in good condition and the outlet channel for the one 54 inch bypass pipe is in good condition. Like the spillway, the channel joints need regrouting in some areas.

d. Overtopping Potential - Calculations by the MDC show that the PMF will overtop the dam by 18 inches. The spillway can safely pass 89 percent of the PMF before overtopping.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations - It is most important to study and consider the history of the design and construction of a dam, especially if it is an older facility. The history of the Saville Dam shows that there is a boil or a wet spot that shows up at the toe of the dam when the level of Compensating Reservoir (downstream) is drawndown. This has occurred since the dam was built and it is generally believed by the personnel of the Metropolitan District that this water could come from a spring which is located near the toe of the dam. This boil could not be observed because the level of Compensating Reservoir was up for seasonal recreation. This spot is monitored by the District very closely and it is not believed to be of any immediate concern. As an additional check for moisture or seepage on the face of the dam, infra-red photographs were taken. No unusual spots were seen in these photographs, although this procedure is far from conclusive.

b. Design and Construction Data - After a thorough examination of the project file for the dam, it was clear that a slope stability analysis had not been done. At the time of design, this design technique had not been developed.

c. Operating Records - The water level is monitored from the District Headquarters for this facility. Records show that for the storm of 1955 a head of 6.25 feet was realized. The MDC design head for this spillway is 7.5 feet. Because the spillway is keyed into very firm ledge and there are no evidences of cracking or movement, the structure's integrity appears adequate.

d. Post Construction Changes - The evidences of post construction changes have been:

1. Washout at the bottom of the spillway channel.
2. Minor development of seepage and efflorescence spots in the upper gate house and service tunnel.
3. Boils, spring or a wet spot under the water surface (Compensating Reservoir) at the toe of the dam.
4. Backing-up of the surface water runoff into the underdrain system for the dam.
5. Slight settlement of the parapet type walls at the upper gate houses.

All of these evidences have been studied extensively by the staff of the Metropoliton District and solutions or continued observations have been instituted as a result.

e. Seismic Stability - The dam is located in Seismic Zone No. 1 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - The inspection of the Saville Dam pointed out some of the potential wear points that exist for this structure. The text of this report discusses each of these points. In general, the condition of the dam and its appurtenant structures is good.

The structural capacity of this embankment seems to be adequate. In addition, there appears to be no alarming signs of any serious structural problems. Section 6 deals with the structural deficiencies that presently exist. It is important to continue monitoring these items so that any ensuing structural changes can be noted.

b. Adequacy of Information - The assessment of the condition of the dam can be based on the information available as well as on the visual inspection.

c. Urgency - The owner shall implement the recommendations and remedial measures described in the following sections within two to three years after receipt of this Phase I Inspection Report.

d. Need for Additional Investigation - There is no need for additional investigation.

7.2 Recommendations

It is recommended that the following actions be undertaken by the owner:

1. A metering point be established at the toe of the dam so that the seepage from the body of the dam can be measured. This would provide a point of reference for the Metropolitan District to use for their future inspections and evaluations.

   The metering point should be equipped for the measuring of seepage discharge, monthly.

2. The temperature of the seepage water should be measured. This temperature should be compared with the upstream reservoir water temperature to evaluate the velocity of its travel through the dam.

3. The damaged surfaces of the stone columns of the upper gate house bridge, seepage and leaching cracks and joints in the concrete of the upper gate house and the service tunnel should be photographed and recorded once every two years.

4. A systematic inspection program during periods of the highest and lowest reservoir and downstream water level should be implemented once in five years so that all features of the dam are evaluated.

5. The eastern end of the dam should be built up so the PMF will not overtop the dam.

Any of the above recommendations that require additional investigation should be done by a qualified engineering firm.

7.3 Remedial Measures

It is considered important that the following items be attended to as early as practical:

a. Alternatives - Not applicable.

b. O & M Maintenance and Procedures -

1. Grass, brush and trees on the downstream face of the dam should be removed to facilitate visual observation.

2. The catch basins on the berms of the dam should be protected from collecting debris.

3. The project of the Metropolitan District to divide the surface and internal drains of the dam should be completed. This will increase the reliability of the dam drainage system and make easier its observation and control.

4. A specific set of instructions should be formulated by the owner as to the placing of the 200 foot

length of sandbags or raise the top of the dam at the east wing.

5. Because of the location of the dam upstream of a populated area, round-the-clock surveillance should be provided during periods of unusually heavy precipitation.

6. The owner should develop a formal system for warning downstream residents in case of an emergency.

APPENDIX A

VISUAL INSPECTION CHECK LIST A-1 to A-8

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Saville Dam (Barkhamsted Reservoir)

DATE 5-25-78

TIME 8:00 a.m.

WEATHER Cloudy

W.S. ELEV. 530.5 U.S. ____ DN.S.

PARTY:

1. Richard Lyon
2. Miron Petrovsky
3. Gary Giroux
4. John Schearer
5. Otis Matthews
6. John Pozzato
7.
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Upstream Temperature: 14 C°

Downstream Temperature: 14 C°

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam	DATE 5-25-78
PROJECT FEATURE	NAME Richard Lyon
DISCIPLINE	NAME Gary Giroux

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Some tree growth to be replaced by grass - good condition.
Current Pool Elevation	Some slippage of original riprap west side - good condition.
Maximum Impoundment to Date	Good Condition
Surface Cracks	None
Pavement Condition	Good
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	None Observed
Horizontal Alignment	None Observed
Condition at Abutment and at Concrete Structures	NA
Indications of Movement of Structural Items on Slopes	NA
Trespassing on Slopes	Not permitted - patrolled
Sloughing or Erosion of Slopes or Abutments	Very minimal
Rock Slope Protection - Riprap Failures	West face slight - no other failures
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	Good - new contract to improve
Toe Drains	Toe under water
[illegible]	None

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam DATE 5-25-78

PROJECT FEATURE NAME M. Petrovsky

DISCIPLINE NAME J. Schearer, J. Pozzato

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channe	
Slope Conditions	
Bottom Conditions	Under water
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	See Mechanical
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam DATE 5-25-78

PROJECT FEATURE NAME R. Lyon, Otis Matthews

DISCIPLINE NAME M. Petrovsky, J.Pozzato

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Good - Granite blocks, hairline cracks
Condition of Joints	Good to Fair - some joint's head pointing
Spalling	None
Visible Reinforcing	N/A
Rusting or Staining of Concrete	Some staining in stairway
Any Seepage or Efflorescence	Some staining in stairway
Joint Alignment	Very Good
Unusual Seepage or Leaks in Gate Chamber	None
Cracks	Small amount of hairline
Rusting or Corrosion of Steel	Limestone and dampness corrected by dehumidication system
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	Bridge Crane - operable
Elevator	None
Hydraulic System	None
Service Gates	Mechanically - old but operable Electrically - Rewiring needed
Emergency Gates	None
Lightning Protection System	None
Emergency Power System	Diesel Generator - operable
Wiring and Lighting System	Rewiring needed but not related to safety of dam

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam

DATE 5-25-78

PROJECT FEATURE

NAME G. Giroux

DISCIPLINE

NAME M. Petrovsky

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Fair to Good
Rust or Staining on Concrete	Ten percent wall area
Spalling	None or slight
Erosion or Cavitation	Good Condition
Cracking	Very slight
Alignment of Monoliths	Good - Grouting than the years to stop leaking at core wall interface on pond side.
Alignment of Joints	Good - Each joint is rusted and slightly wet
Numbering of Monoliths	16

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam

DATE 5-25-78

PROJECT FEATURE

NAME R. Lyon

DISCIPLINE

NAME G. Giroux

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good
Rust or Staining	Minor
Spalling	Minor
Erosion or Cavitation	Minor
Visible Reinforcing	Minor
Any Seepage or Efflorescence	Some
Condition at Joints	Some need painting
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	No
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam DATE 5-25-78

PROJECT FEATURE ______ NAME M. Petrovsky

DISCIPLINE ______ NAME J. Schearer

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Under water - never dredged drought condition showed no siltation - clear.
b. Weir and Training Walls	
General Condition of ~~Concrete~~ Granite	Good
Rust or Staining	Slight
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Some
Drain Holes	Some
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Good
Other Obstructions	None
	Granite walls need repointing in some locations - not bad.

PERIODIC INSPECTION CHECK LIST

PROJECT Saville Dam

DATE 5-25-78

PROJECT FEATURE

NAME R. Lyon

DISCIPLINE

NAME M. Petrovsky

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	Concrete Arch Bridge
Anchor Bolts	With Granite Stone Facing
Bridge Seat	With Granite Stone Facing
Longitudinal Members	With Granite Stone Facing
Under Side of Deck	Good - Some lime seepage
Secondary Bracing	Good - Some lime seepage
Deck	Good
Drainage System	Good
Railings	Good - Granite Stone Parapets
Expansion Joints	N/A
Paint	N/A
b. Abutment & Piers	
General Condition of Concrete	Heavy Seepage through mortar joints on downstream side.
Alignment of Abutment	Good
Approach to Bridge	Good
Condition of Seat & Backwall	N/A
	All Granite needs some pointing.

APPENDIX B

All references listed below except numbers 14, 15, and 16 are located at the MDC Headquarters, 555 Main Street, Hartford, Connecticut.

1. "The Construction of Stream Control Works and the Lower Portion of the Bills Brook Dam", Contract 15. The Metropolitan District; Hartford County, Connecticut; Water Bureau, 1933.

2. "The Construction of the Second Portion of the Bills Brook Dam", Contract 17. The Metropolitan District; Hartford County, Connecticut; Water Bureau, 1935.

3. "Contract Plans for the completion of the Bills Brook Dam and Appurtenant Structures of the Barkhamsted Reservoir", Contract 17 (Volumes I and II). The Metropolitan District; Hartford County, Connecticut; Water Bureau, 1937.

4. Geology Reports - East and West Branches of the Farmington River. The Metropolitan District; Hartford County, Connecticut; Water Bureau, 1929-1932.

5. Model Tests on Spillway of Bills Brook Dam Barkhamsted Reservoir. Alden Hydraulic Laboratory; Worcester Polytechnic Institute; August, September, 1935.

6. Model Tests on Cone Valve Outlet Barkhamsted Reservoir. Alden Hydraulic Laboratory; Worcester Polytechnic Institute; June, 1936.

7. Model Test on Spillway Channel Barkhamsted Reservoir. Alden Hydraulic Laboratory; Worcester Polytechnic Institute; March, 1937.

8. "Bills Brook Dam - Spillway Channel and Wall Analysis". The Water Bureau of the Metropolitan District; Hartford, Connecticut; October, 1934.

9. "Bills Brook Dam - Overturning Factor of Spillway Weir". The Water Bureau of the Metropolitan District; Hartford, Connecticut; April, 1938.

10. Saville Spillway Model. Alden Hydraulic Laboratory; Worcester Polytechnic Institute; May, 1956.

11. Inspection of Saville Dam. The Metropolitan District; Hartford County, Connecticut; Water Bureau, Designing Division; September 11, 1973 .

12. "Saville Dam Drainage Repairs South Face of Dam and West and East Parking Areas". Drawing 5392, Sheet 1. The Metropolitan District; Hartford County, Connecticut; Water Bureau; April, 1978.

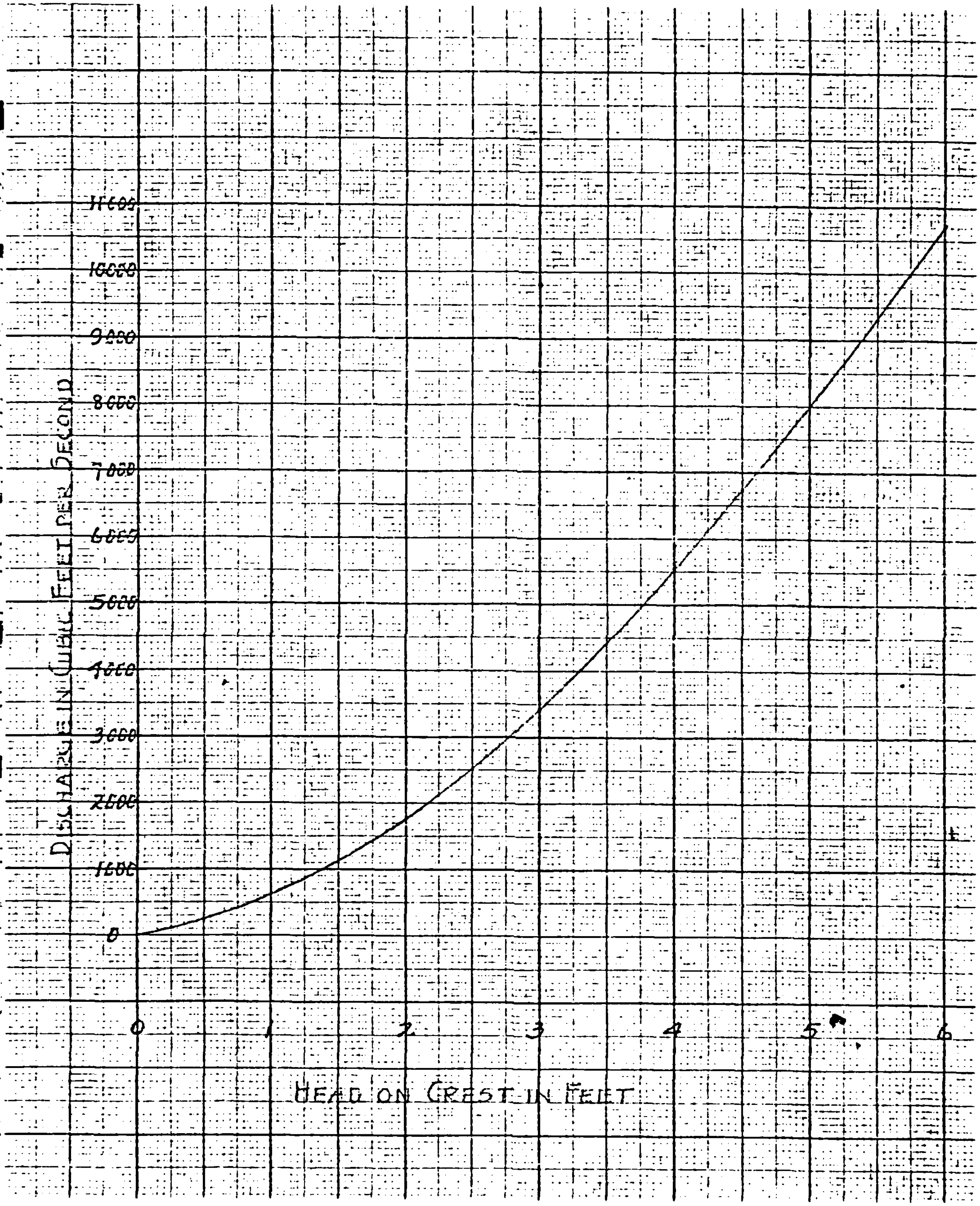
13. "Data on Safety of Metropolitan District Dams". The Metropolitan District; Hartford County, Connecticut; Water Bureau.

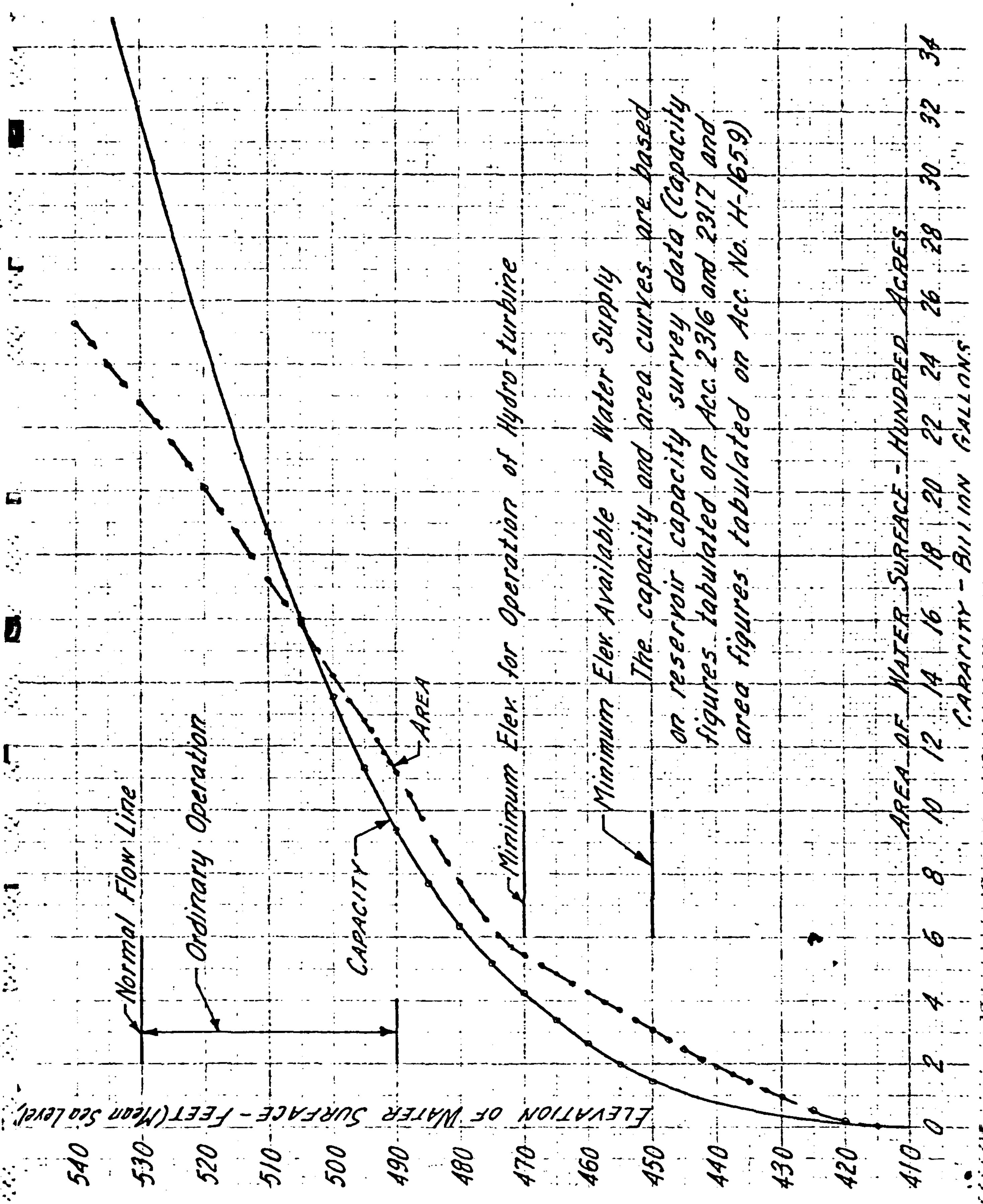
14. Recommended Guidelines for Safety Inspection of Dams. Department of the Army; Office of the Chief of Engineers; Washington, D.C.; November, 1976.

15. Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Inspections. New England Division; Corps of Engineers; March, 1978.

16. Rule of Thumb - Guidance for estimating downstream dam failure hydrographs; Corps of Engineers; April, 1978.

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION




Normal Flow Line
Ordinary Operation
CAPACITY
AREA
Minimum Elev. for Operation of Hydro turbine
Minimum Elev. Available for Water Supply
The capacity and area curves are based on reservoir capacity survey data (Capacity figures tabulated on Acc. 2316 and 2317 and area figures tabulated on Acc. No. H-1659)
AREA OF WATER SURFACE - HUNDRED ACRES
CAPACITY - BILLION GALLONS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
ELEVATION OF WATER SURFACE - FEET (Mean Sea Level)
540 530 520 510 500 490 480 470 460 450 440 430 420 410

Purpose

To estimate behaviour of reservoir during largest conceivable flood with hydrograph similar to that for flows of Aug 18 & 19, 1955. Also study effects of shape of hydrograph.

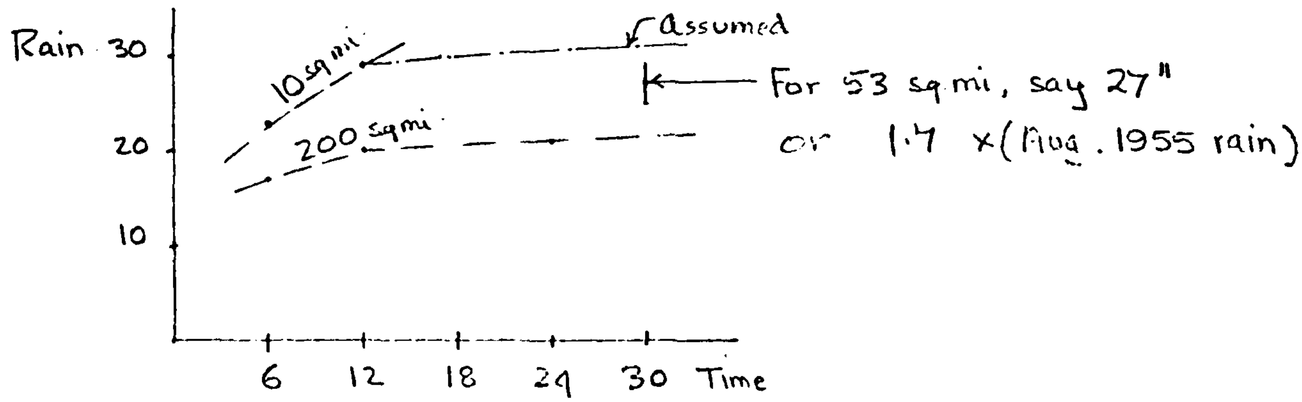
Largest conceivable flood - rainfall

Aug. 1955 flood had rainfall of 16" on 53 sqmi. watershed over a period of approx. 30 hours. Over a period of 24 hours, about 13.5" fell (See Acc H-2691.25).

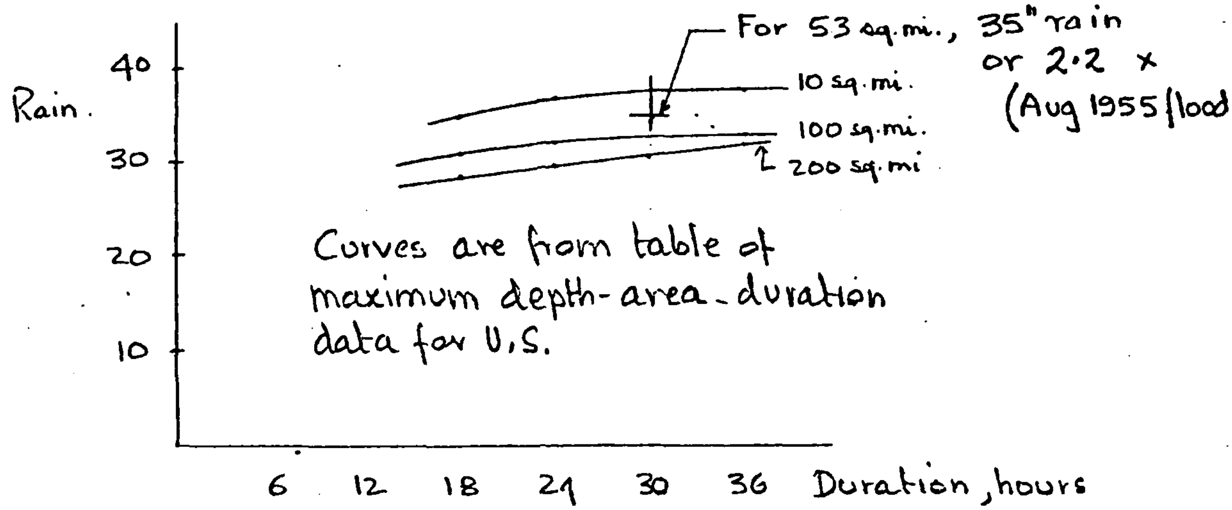
From Boston Soc. of C.E. Journal for Jan. 1942 :-
On p. 37, curve of max. possible rainfall, for selected New England streams, as developed by U.S Weather Bureau in 1940 for Ompompanoosuc Basin Report would give approx. 19" for 30 hour storm, or 1.2 x (Aug 1955 Rain)
(This curve does not include snow melt. See ASCE Trans. Vol. 110, 1945, p. 860 & 861)

From "Applied hydrology", Linsley, Kohler, Paulus, 1949
On pp. 597 through 604 are given charts of maximum precipitation possible for various areas and duration for the central and western parts of the U.S.A.. These charts were compiled by the U.S Weather Bureau and Corps of Engineers. Below are values for Central & N. Connecticut :-

10 sq. mi.	6 hours	23" ← 25"± in U.S.
10 sq mi.	12 hours.	29" Weather Bureau} Research
200 sq mi	6 hours	17" Paper #40{p.57. Technical
200 sq mi	12 hours	20" Max. 6 hr. Precip. for 10 sq.mi.
200 sq. mi.	24 hours	21" (published 1961)



On p. 125 of "Applied Hydrology", maximum rainfall for 53 sq mi. for 30 hours could be interpolated as shown:—



Summary

Taking the average of the above ratios of max. to Aug 1955 flood, we get $\frac{1}{3}(1.2 + 1.7 + 2.2) = \underline{1.7}$ This value then agrees with the Weather Bureau - Army Eng's figure, but is below the maximum recorded anywhere, so to be a little more conservative, 2 is used. While there is no safety in averages, the writer feels that a flood twice the size of the Aug. 1955 one is the maximum conceivable - even if not the maximum possible! However, snow melt is not taken into account, torrential rains occuring during the late summer.

Largest conceivable flood - run off

In Aug. 1955, on 53 sq.mi. of watershed, the maximum runoff was 735 c.f.s per sq.mi. (Acc. H-2691.3)

From "Flood formulas based on drainage basin characteristics", Kinnison & Colby, Trans. A.S.C.E, Vol. 110, p. 868, a rare flood peak would be 700 c.f.s / sq. mi. — which has been surpassed.

From "Hydro Electric Handbook", Creager & Justin, 1949, 2nd Ed, p 62 the Creager Equation, C = 100 would give 1,600 c.f.s / sq. mi. The streams which give flows of this value with comparable areas lie in Texas, California, West Virginia. Value = 2.2 × (Aug 1955 flood)

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

From large chart of runoff v. drainage area kept by Design Div. based on report of Committee on Floods, Boston. S.C.E. Sept 1930

Trying certain formulae :-

Jarvis / Meyer : $Q = 10{,}000\sqrt{53}$ = 72,800 c.f.s
= 1,375 c.f.s /sq.mi.

All other formulae would come below this value.

Value = 1·9 x (Aug. 1955 flood.)

Summary

A peak runoff of twice the Aug 1955 flood value would appear to be a reasonable assumption for the maximum conceivable flood.

Hydrograph

Values for Aug. 1955 flood doubled. Inflows taken directly from Acc. H-2691-4. Hours assumed same for convenience of reference.

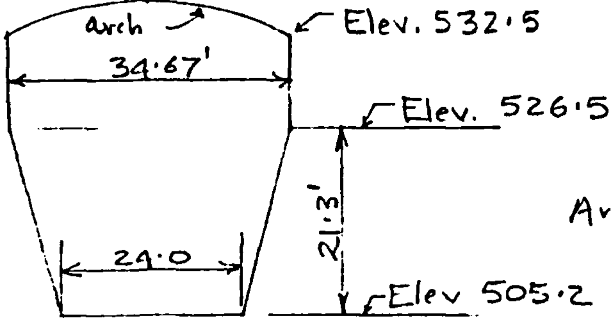
Spillway discharge

See the following two sheets.

Reservoir capacity

Curve of "inflow in c.f.s., per foot rise per hour" v. Resvr. Elev. as show on Acc. H-2691·10 projected as shown three sheets below.

Check of assumption that N side of bridge is control point



Area below 526.5 is 622 sq.ft

From 1935 Model Test Report, Sheet C,
Q = 17,200 c.f.s, Pond Elev. 538.5 Average
Depth water at N side of bridge, "N wall" 23.8',
"S wall" 18.3'

Mean depth = 21.0

∴ area of flow $A = \left(24.0 + \frac{21.0}{4}\right) \times 21 = 615$ sq.ft.

∴ vel, $v = 28$ ft/sec

vel. head, $h_v = 12.2'$

∴ Energy gradient = 505.2 + 21.0 + 12.2 = 538.4 which is same as pond Elev, no loss over weir occurs, apparently

Critical vel. $= \sqrt{g \frac{A}{B}}$ where A = CSA of flow
B = water surface width

$= \sqrt{g \cdot \frac{615}{34.5}} = 24.0$ ft/sec. $h_v = 9.0$ ∴ Pond would be 536.2.
Q = 14,700

Apparently control point is further upstream or else it may well lie on a line not perpendicular to the channel.

It would appear that the water flowing over the north section of the weir would have been accelerated much more than the water from the south end of the weir by the time it reached the bridge because of the longer sloping path from north end of the weir to the bridge. Consequently the critical section forms an ill defined line across the weir "basin".

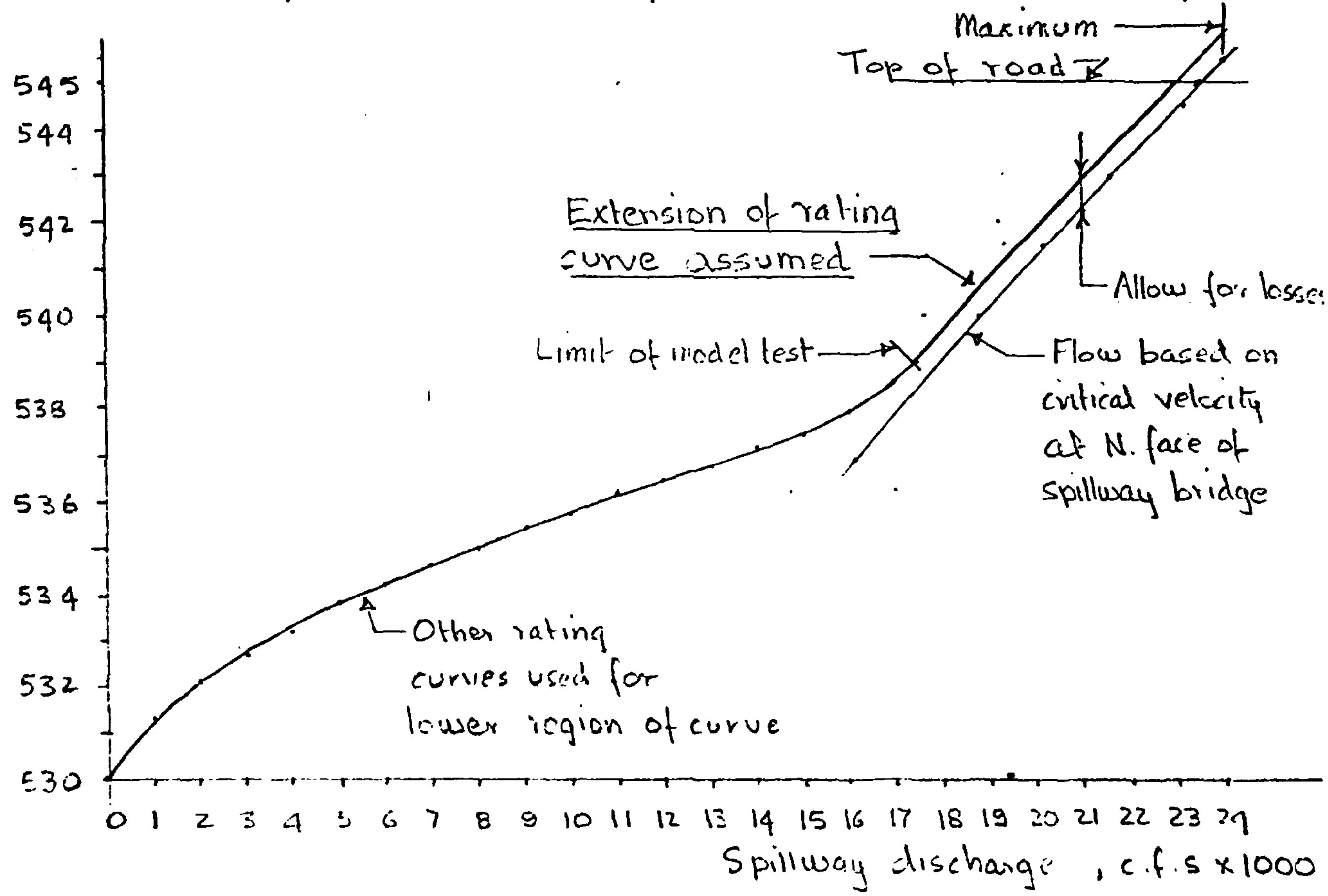
However, for an analysis of ultimate conditions, it would be conservative to assume that with the weir and weir basin flooded out that the control section lies at the bridge.

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Ultimate capacity - control at N end of spillway bridge

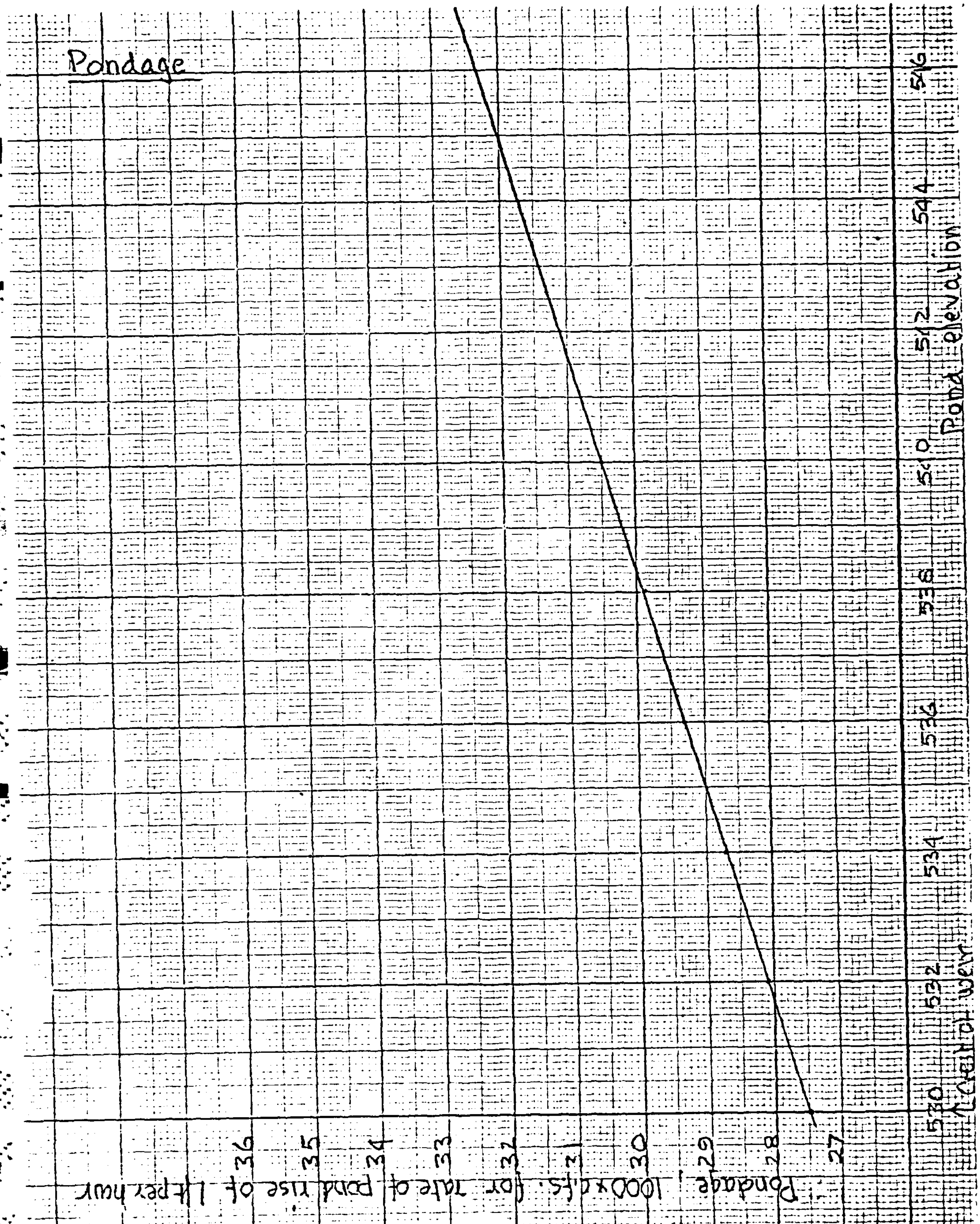
Try various depths of flow :-

Depth of flow. D ft.	Water CSA. A sq.ft.	Water surface B ft.	Critical velocity v_c ft/sec.	Velocity head h_v ft.	Pond. Elev. 505.2 + D+h_v	Flow Q c.f.s
22.3	657	34.67	24.6	9.4	536.9	16,100
24.3	726	"	26.0	10.5	540.0	18,800
25.3	761	"	26.6	11.0	541 5	20,200
26.3	795	"	27.2	11.5	543.0	21,600
27.3	830	"	27.8	12.0	544.5	23,100
27.8	846 ±	33.8±	28.4	12.5	545.5	24,000



Note : this curve is less conservative than that shown in Model Test, 1935 opposite rating curve. (Back of p.6) However, that curve is merely "assumed".

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION



COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Reservoir elevations - for flood of double intensity of that of Aug 1955

Initial pond Elev. 530.00 at 6 AM

Day	Time hrs. ending	Inflow c.f.s. average in period	Pond elevation End of period	Pond elevation Rise in period	Spillway Q for average pond. Elev.	Pondage for rise in pond.	Total inflow c.f.s. Check
Thursday	6 AM.		530.00		c.f.s.	c.f.s.	
	8	3,100	530.22	0.22	50	3,030	3,080
	10	5,300	530.59	0.37	200	5,100	5,300
	NOON	10,900	531.33	0.74	600	10,250	10,850
	1 PM	25,800	532.20	0.87	1,550	24,250	25,800
	2	31,300	533.20	1.00	3,000	28,300	31,300
	3	23,700	533.87	0.67	4,650	19,100	23,750
	4	18,600	534.32	0.45	5,750	13,000	18,750
	5	15,600	534.63	0.31	6,700	8,900	15,600
	6	10,600	534.75	0.12	7,200	3,500	10,700
	7	8,700	534.79	0.04	7,450	1,160	8,510
	8	8,700	534.83	0.04	7,500	1,160	8,660
	9	7,500	534.83	—	7,500	—	7,500
	10	7,500	534.83	—	7,500	—	7,500
	11	15,600	535.10	0.27	7,850	7,800	15,650
Friday	MIDNT	24,200	535.62	0.52	8,950	15,100	24,050
	1 AM	39,600	536.59	0.97	11,000	28,500	39,500
	2	52,200	537.87	1.28	14,450	37,900	52,350
	3	58,900	539.27	1.40	17,000	42,000	59,000
	4	48,500	540.27	1.00	18,200	30,300	48,500
	5	51,800	541.35	1.08	19,000	33,100	52,300
	6	43,400	542.13	0.78	19,800	24,000	43,800
	7	34,700	542.59	0.46	20,500	14,300	34,800
	8	43,400	543.31	0.72	20,900	22,700	43,600
	9	78,900	545.09	1.78	22,200	56,500	78,700
	10	40,200	545.62	0.53	23,400	17,000	40,400
	11	28,600	545.77	0.15	23,700	4,850	28,550
	NOON	21,000	545.69	-0.08	23,700	-2,600	21,100
	1 PM	17,200	545.49	-0.20	23,600	-6,500	17,100
	2	13,600	545.18	-0.31	23,300	-9,900	13,400

Crest 0.77' above lowest road grade. In view of parapet walls for length of dam & very short stretch of low road grade, sandbagging would easily save dam.

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Effect of changing shape of hydrograph used above

The hydrograph is revised as follows:- all flows prior to the peak flow are arranged in order of increasing intensity, thereby giving a regular shaped hydrograph as would occur with rains of steadily increasing magnitude per hour.

"Time"	Inflow	Pond elev.		Spillway aver Q	Pondage	Total inflow check
		End of period	Rise			
10 A.	← As for 1st case →	530·59		c.f.s	c.f.s.	
NOON	7,500	531·10	0·51	500	7,000	7,500
1 P	7,500	531·34	0·24	900	6,700	7,600
2	8,700	531·61	0·27	1100	7,500	8,600
3	8,700	531·87	0·26	1400	7,250	8,650
4	10,600	532·22	0·35	1800	9,800	10,600
5	10,900	532·53	0·31	2300	8,650	10,950
6	15,600	532·98	0·45	3000	12,700	15,700
7	15,600	533·40	0·42	3800	11,900	15,700
8	18,600	533·89	0·49	4700	14,000	18,700
9	23,700	534·50	0·61	6,000	17,700	23,700
10	24,200	535·07	0·57	7,600	16,500	24,100
11	25,800	535·65	0·58	9,000	16,800	25,800
MIDNT	31,300	536·36	0·71	10,700	20,800	31,500
1 AM	34,700	537·10	0·74	13,000	21,800	34,800
2	39,600	537·92	0·82	15,200	24,300	39,500
3	43,400	538·81	0·89	16,800	26,600	43,400
4	43,400	539·67	0·86	17,600	25,900	43,500
5	48,500	540·66	0·99	18,400	30,100	48,500
6	51,800	541·72	1·06	19,300	32,500	51,800
7	52,200	542·75	1·03	20,300	32,000	52,300
8	58,900	543·93	1·18	21,500	37,200	58,700
9	78,900	545·69	1·76	22,800	56,200	79,000
10	40,200	546·20	0·51	23,900	16,300	40,200
11	28,600	546·34	0·14	24,200	4,500	28,700
NOON	17,200	Drops				

"Idealized hydrograph"

Hydrographs studied so far have peaks at the end of the flood. Usually, for a simple storm without long periods elapsing between downpours,* a single peak would be characteristic of the hydrograph, this peak occuring within a few hours of the commencement of the storm.

From B.S.C.E. Journal, Sept. 1930, p. 24, concentration period for 50 sq. mi. basin would be about 6 hours. So let this be used, but at 6½ hours to give max. average for 1 hour period.

If hydrograph is triangular and peak is 78,900 c.f.s., also quantity of total runoff is 85% as against $\frac{11.8}{16.0} \times 100 = 74\%$ at 5 hrs after peak in Aug. 1955 flood (See Acc. H-2691-35), total quantity of water $= 2 \times \frac{85}{74} \times 1{,}459.6 = 3{,}360$ Million c.f.

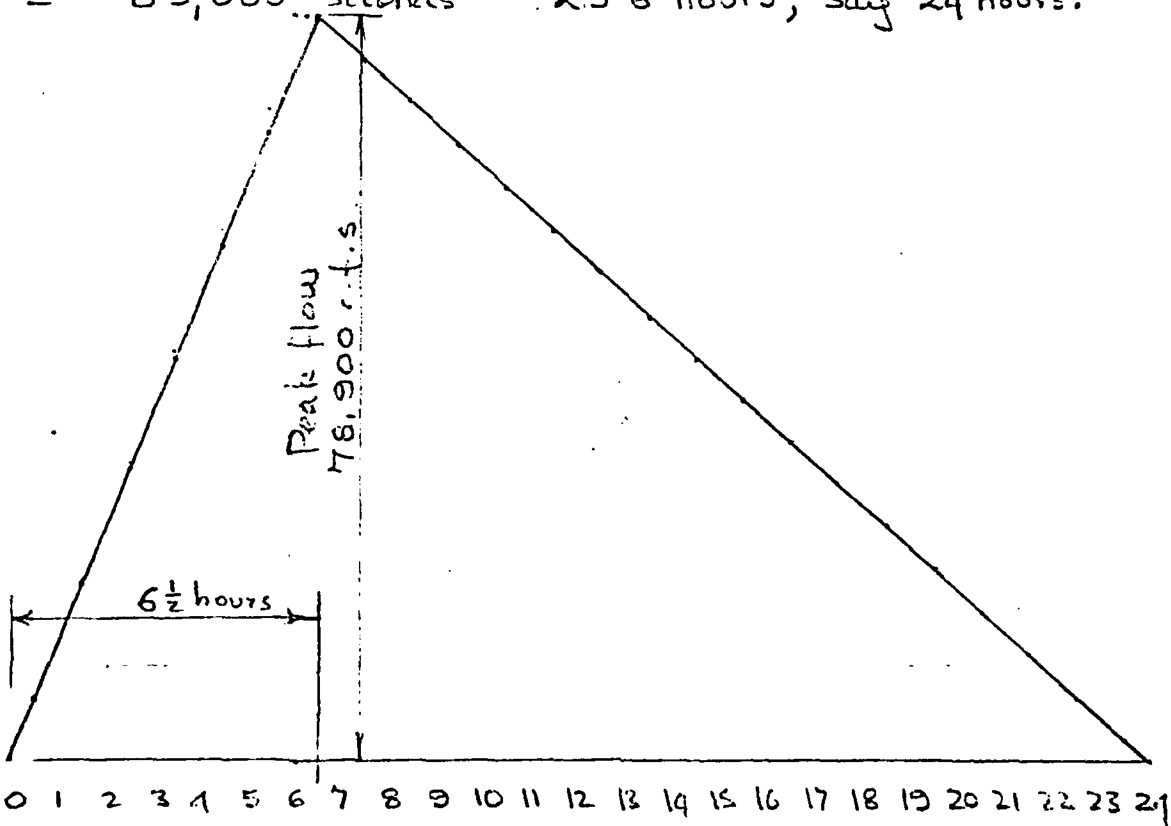
For storm twice that of Aug '55

From H-2691-30

Average flow $= \frac{78{,}900}{2} = 39{,}450$ c.f.s.

∴ length of time of flood to be assumed $= \frac{3{,}360{,}000{,}000}{39{,}450}$

= 85,000 seconds = 23.6 hours, say 24 hours.



*The Aug 18-19, 1955 hydrograph is of the complex type due to two distinct storms periods

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Reservoir elevations with "idealized hydrograph", early peak

Time end of period	Inflow, average	Pond Elev		Spillway Average Q	Pondage	Total inflow check
		End of period	Rise			
0		530.00				
1	6,500	530.24	0.24	50	6,550	6,600
2	19,000	530.92	0.68	300	18,700	19,000
3	31,000	532.00	1.08	1,050	30,000	31,050
4	42,500	533.40	1.40	2,900	39,600	42,500
5	54,500	535.09	1.69	6,200	48,400	54,600
6	66,500	537.01	1.92	10,900	55,800	56,700
7	78,900	539.11	2.10	16,300	62,600	78,900
8	74,000	540.94	1.83	18,300	55,500	73,800
9	70,000	542.56	1.62	19,900	50,100	70,000
10	65,000	543.95	1.39	21,200	43,900	65,100
11	60,500	545.18	1.18	22,500	37,500	60,000
12	56,000	546.19	1.01	23,700	32,500	56,200
13	51,500	547.04	0.85	24,000 max. assumed. (Free-pressure flow under bridge)	27,500	
14	47,000	548.56	0.71		23,000	
15	42,500	549.13	0.57		18,500	
16	38,000	549.55	0.42		14,000	
17	33,500	549.82	0.27		9,500	
18	29,000	549.97	0.15		5,000	
19	24,500	549.98	0.01		500	
20	20,000	Drops				

Comment

Elev. 550 is above parapet walls etc. so unless very extensive sandbagging were used, the Saville Dam would fail.

The hydrograph is doubtlessly too extreme – its duration is 24 hours instead of 32+ for the previous hydrographs which would indicate the 32" rain in 24 hours – which apparently has bee[n] exceeded in the U.S.A. before (Thrall, Texas, 1921) (See sheet BF-2).

Now the above hydrograph has an early peak. For comparison, try the hydrograph reversed, ie. peak occuring $6\frac{1}{2}$ hours before end of storm. This will give an indication of the effect of time of occurrence of peak.

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Reservoir elevations with idealized hydrograph", late peak

Time end of period	Inflow average	Pond Elev		Spillway average Q	Pondage	Total inflow check
		End of period	Rise			
0		530.00				
1	2,000	530.07	0.07	20	1,920	1,940
2	6,500	530.30	0.23	100	6,350	6,450
3	11,000	530.69	0.39	250	10,750	11,000
4	15,500	531.23	0.54	550	15,000	15,550
5	20,000	531.91	0.68	1,200	18,900	20,100
6	24,500	532.70	0.79	2,200	22,300	24,500
7	29,000	533.60	0.90	3,700	25,400	29,100
8	33,500	534.57	0.97	5800	27,600	33,400
9	38,000	535.60	1.03	8,200	29,800	38,000
10	42,500	536.67	1.07	11,100	31,400	42,500
11	47,000	537.77	1.10	14,500	32,600	47,100
12	51,500	538.93	1.16	16,800	34,800	51,600
13	56,000	540.19	1.26	17,900	38,200	56,100
14	60,500	541.54	1.35	19,000	41,400	60,400
15	65,000	542.98	1.44	20,300	44,500	64,800
16	70,000	544.52	1.54	21,600	48,600	70,200
17	74,000	546.11	1.59	23,200	51,000	74,200
18	78,900	547.83	1.72		55,900	
19	66,500	549.12	1.29		42,500	
20	59,500	550.04	0.92	24,000 max.	30,500	
21	42,500	550.53	0.55		18,500	
22	31,000	550.80	0.21		7,000	
23	19,000	Drops				

Comment

Apparently a late peak gives a higher reservoir elevation than an early one – but not much higher, less than 1.0' in the above cases.

The result is logical – with an early peak, the pond is high early and the spillway discharge is more effective than with a late peak when the pond rises more slowly and discharges less during the early stages of the flood.

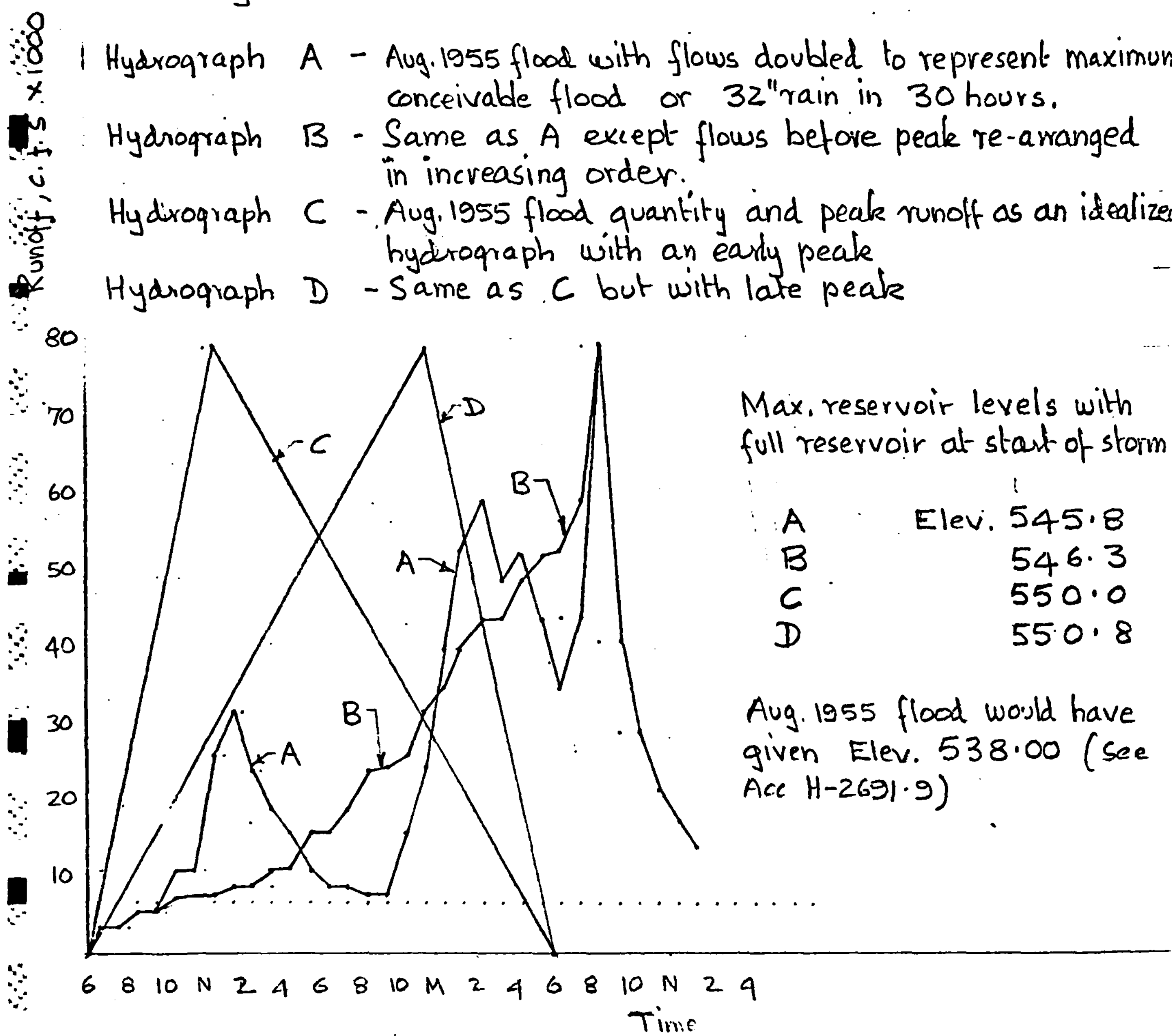
Summary

1 Hydrograph A - Aug. 1955 flood with flows doubled to represent maximum conceivable flood or 32" rain in 30 hours.

Hydrograph B - Same as A except flows before peak re-arranged in increasing order.

Hydrograph C - Aug. 1955 flood quantity and peak runoff as an idealized hydrograph with an early peak

Hydrograph D - Same as C but with late peak



Max. reservoir levels with full reservoir at start of storm

A	Elev.	545·8
B		546·3
C		550·0
D		550·8

Aug. 1955 flood would have given Elev. 538·00 (See Acc H-2691·9)

Comments

C and D are considered to be too severe to be reported for maximum conceivable flood hydrographs, but they demonstrate that a late peak will give rather higher pond elevations than an early peak, although the difference in levels is rather small (0·8 ft)

A and B are taken as the maximum conceivable flood and the results of C and D would imply that B is about the worst case probable, as the peak is at the end of the storm.

COMPUTATIONS SUPPLIED BY METROPOLITAN DISTRICT COMMISSION

Conclusions

1. *Maximum conceivable rainfall is 32" in 30 hours, or double the amount which fell during the storm of Aug. 1955 in the same period. However the maximum rainfalls ever recorded would probably give 35" for the area of Barkhamsted Reservoir watershed in 30 hours. (See sheets BF-1 & 2)

2. Maximum conceivable peak runoff is double that occuring with the Aug. 1955 flood, or 1470 c.f.s/sq.mi. This is less than the maximum which has been recorded in this country for a comparable watershed area (1730 c.f.s/sq.mi. on 60.8 sq.mi. in Texas) but is probably a "reasonable" value for this region

3. The idea of "conceivable" takes into consideration the past history of floods in the New England region and elsewhere and on any probability curve, the assumed storm is usually way off the chart. It must be emphasised that the maximum possible flood is unknowable and inconceivable and cannot be reckoned with.

4. The maximum flood would endanger the Saville Dam, unless the reservoir was drawn several feet below flow line at the start of the storm. Depending on the distribution of rainfall during the storm period, the reservoir would reach a level not exceeding Elev. 546.5 which is 18" above the roadway at the east end of the dam, where there is no parapet or elevated walkway to provide extra freeboard as along the length of the dam itself. However, the length of sandbagging required to protect the east end to Elev. 548 is only a couple of hundred feet or so.

5. With intellegent operation and watchfulness during emergencies, there is no reason to doubt that the Saville Dam will take the largest conceivable flood, or about twice the Aug. 1955 flood intensities, without failure.

* This is for the flashy tropical rainstorms without snowmelt.

The Metropolitan District
Hartford County, Connecticut
Water Bureau
Designing Division

Des. Div. Ref. No. S- 1401
Date 9-11-73

INSPECTION OF DAMS AND SPILLWAYS

NAME OF DAM SAVILLE

LOCATION (Town, River, Reservoir) East Branch Farmington River in Barkhamsted

INSPECTORS	Name	Title	Div./Dept.
	Dick Allen	Ast. Engr.	S & P
	Dick Conopask	Sr. Engr.	Design

In filling out this form, please enter full information on conditions, and on location of any defects.

A. GENERAL

1) Were any photographs taken of the dam during this inspection Yes

2) Reservoir level, Elev. 526.58

3) Weather (including comment on humidity) Cool, dry, sunny (beautiful fall day)

B. EARTH DAMS

1) Note any depressions in crest None

2) Slides and/or erosion, upstream face None

3) Slides and/or erosion, downsteam face Minor erosion where turf has been worn away in footpaths (1 on dam - Picture #1, 1 near spillway - Picture #2)

4) Cracks in embankment None (5± Woodchuck holes)

5) Surfacing on crest and condition Bit. Conc. road surface - good

Grass on berm worn (west of Upper Gate house to Spillway).

6) Condition of parapet walls, if any Generally O.K. - minor joint pointing

& caulking of contraction joints necessary.

7) Seepage on downstream face, especially at toe, (location and quantity)

See Section H, #3. East end not visible, See #13 this section.

8) Soft ground at toe (locate) None visible

9) Signs of settlement at gate house and/or gate house bridge Causeway settling

down with respect to gate house, causing cracking on causeway wall -

Picture #18. Settlement has been monitored in past.

10) Downstream drainage system (clear or blocked, etc.) Mostly clear; stone

paved ditches need de-grassing (work is in progress). *

11) Type and condition of downstream face planting Grass - O.K.; no major

plantings; natural growth @ East end heavy.

12) Is planting and/or debris etc. a fire hazard? No

13) Do plantings obscure toe of dam and other points where monitoring inspection is necessary? Natural growth on East end does -- Picture #3

14) Damage or vandalism (to lights, plaques, etc.) Usual littering

15) Other Field personnel would like plantings on upstream face & upper

slope of downstream face of dam to eliminate hazardous mowing conditions.

C. CONCRETE DAMS

1) Any signs of motion

* = Catch basins w/ solid covers-

1. Middle level - 5th from west end
2. Top level - west end basin

Some basins on East side have grates covered w/ pine needles and branches.

2) Deterioration noted:

Upstream face ______

Downstream face ______

Road/walk on crest ______

Parapets ______

Spillway ______

Other (excluding gate houses) ______

3) Inspection Gallery:

General condition ______

Leakage ______

Lime accumulation ______

Flooding & drainage ______

Other ______

4) Damage or vandalism (to lights, plaques, etc.) ______

5) Other comments ______

D. GATE HOUSES

1) Upper House

1) Exterior: walls Excellent - crack in SE buttress - Picture #4.

windows Excellent

doors Excellent

roof Excellent - no leaks

2) Superstructure Interior:

walls Excellent - pictures #5 & #6.

floor Excellent

ceiling Excellent

3) Leakage into superstructure None

4) Substructure, interior:

Leakage and condensation El. 507± W & N walls, leakage & condensation begin, severe calcium (lime) deposit formed - Pictures #7, #8 & #9.

Condition of metal work (stairs, etc.) good except for superficial rusting.

5) Equipment condition:

Sluice gates O.K.

Gate valves O.K.

Piping O.K.

Electrical gear O.K.

Other Diesel O.K.

6) Do all electric lights work Hi-voltage problem; switching to 130V bulbs

7) Condition of stop logs in storage well Excellent - half painted w/ heavy duty Rustoleum; half to be painted w/ rubber base paint.

8) Operating personnel comments on functional condition of all equipment (valves, hoists, selector gates, trash racks, screens, etc.) O.K.

9) Last time various wells and other underwater portions were unwatered and examined (Give name of well and date in case of multiple wells).

East Well, Feb., 1968; West Well, March, 1963; Main Well, March, 1968; Selector Gates, Apr., 1964.

10) Other comments Heating/de-humidification of stairwell in upper gate house extremely desirable - pictures #7, #8 & #9.

ii) Lower House

1) Exterior: walls leakage from roof; lime leaching

windows None

doors Casement rotting @ bottom sill location

roof

2) Superstructure Interior:

walls leakage from roof

floor Good

ceiling paint peeling from roof leakage

3) Leakage into superstructure from roof

4) Substructure, interior:

Leakage and condensation minimal

Condition of metal work (stairs, etc.) Good

5) Equipment condition:

Sluice gates O.K.

Gate valves O.K.

Piping Excellent

Electrical gear Good

Other

6) Do all electric lights work Hi-Voltage problem; replacing w/130V bulbs.

7) Condition of stop logs in storage well -

8) Operating personnel comments on functional condition of all equipment (valves, hoists, selector gates, trash racks, screens, etc.)

O.K.

9) Other comments Roof should be fixed to stop leaks.

iii) Conduit between gate houses - Pictures #11 & #12

1) Concrete condition Good

2) Leakage Spring in East Wall (So. End) 1 gpm±; roof leaks, 2 w/ gutters.

3) Condition of metal work and piping Pipe - excellent; walkways need maintenance, railings are flimsy.

4) Other comments replace metal walkway grates w/ aluminum ones to eliminate maintenance.

E. PRINCIPLE SPILLWAY

(If spillway is part of dam, enter information in C only).

1) Weir Excellent

2) Channel Generally Excellent - some joints in floor should be pointed.

3) Outlet of channel Good

4) Note any obstructions to flow None

5) Bridge Generally good, some leaching on North & South faces from road surface.

6) Is water spilling No

7) Other comments

F. EMERGENCY SPILLWAY

1) Channel None

2) Obstructions

3) Other comments

G. APPURTENANT STRUCTURES

List structure (such as stilling pools, discharge weir structures, stream diversion works, etc. and give conditions.

Diversion works - generally excellent (picture #13) but access road & works overgrown. Brook to Compensating Reservoir also overgrown. This is particularly objectionable @ culverts (Pictures #14 & #15).

H. OVERALL ASSESSMENTS

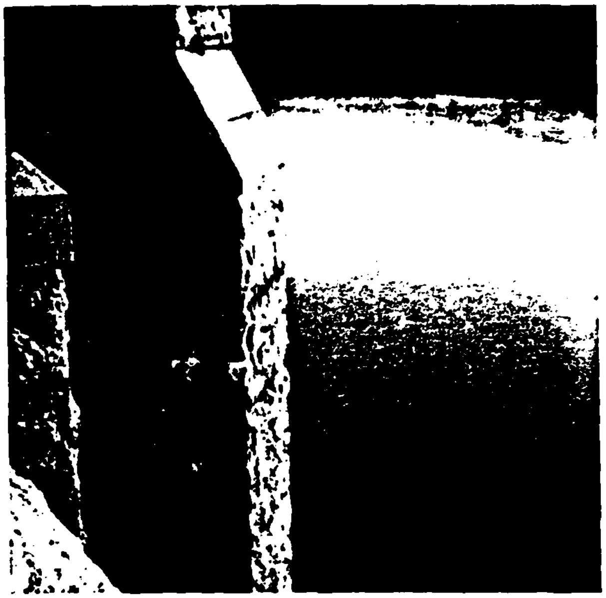
Is this dam with its appurtenances maintained in a condition satisfactorily to the Inspectors? (1) Exterior - excellent; interior of gate houses need better housekeeping procedures (see Picture #10). (2) East end of dam needs plantings on both sides of fence to improve appearance & reduce maintenance (pictures #16 & #17). (3) This dam was reinspected on October 17, 1973 with the Compensating Reservoir drawn down about 15' to observe a known seepage condition which is normally submerged. This seepage is apparently through the dam and does not seem to have increased in the past 8 years. Flow is estimated @ between 50 and 75 g.p.m. This condition should be monitored on future inspections. See picture #19.

For pool inspection
see S-1401

#1 Minor erosion on path, downstream side of dam

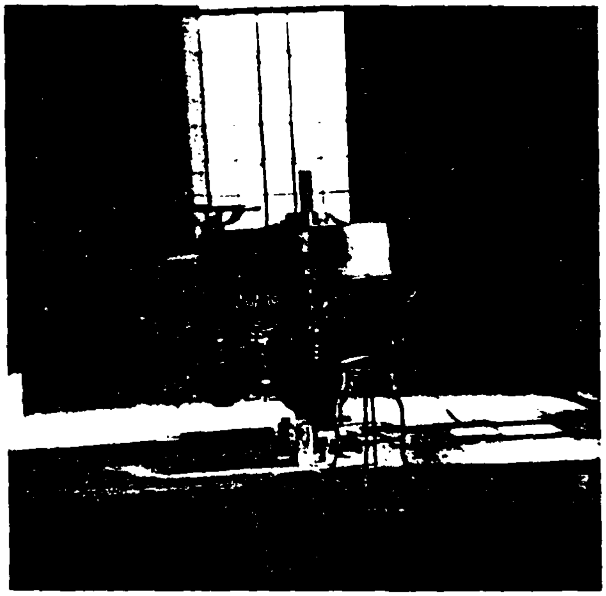
#2 Erosion on path near spillway.

#3 Heavy growth on East Toe of Dam. (Far end)



#4 Crack in W.E. Buttress
of Upper Gate House

#5 Interior of Upper
Gate House



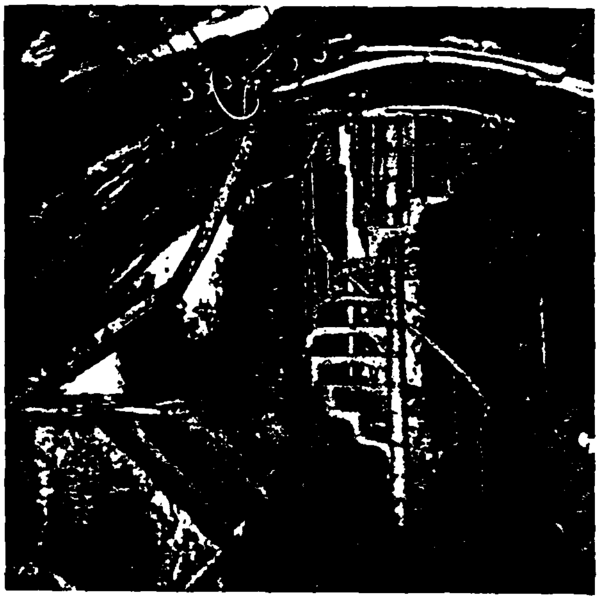
#6 Interior of Upper
Gate House

DOWN

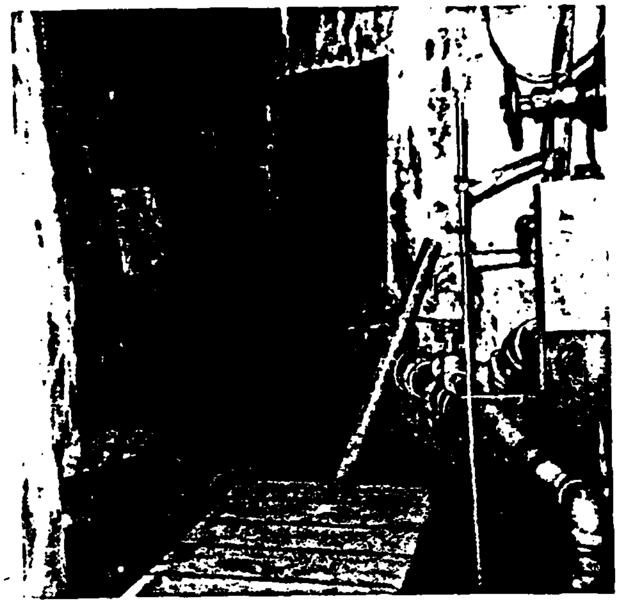
#7 Beginning of leaching in Upper Gate House Stairwell

DOWN

#8 Lime deposits on walls & stairs of Upper Gate House stairwell

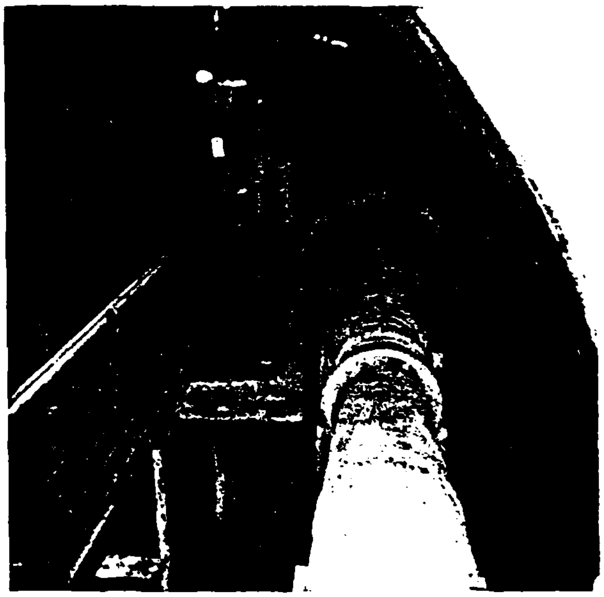


#9 Bottom of Upper Gate House Stairwell



#10 Lower Gate House
substructure

#11 Conduit between Houses, showing minor leak in roof, and handrail



#12 Conduit between Houses showing excellent condition of Venturi

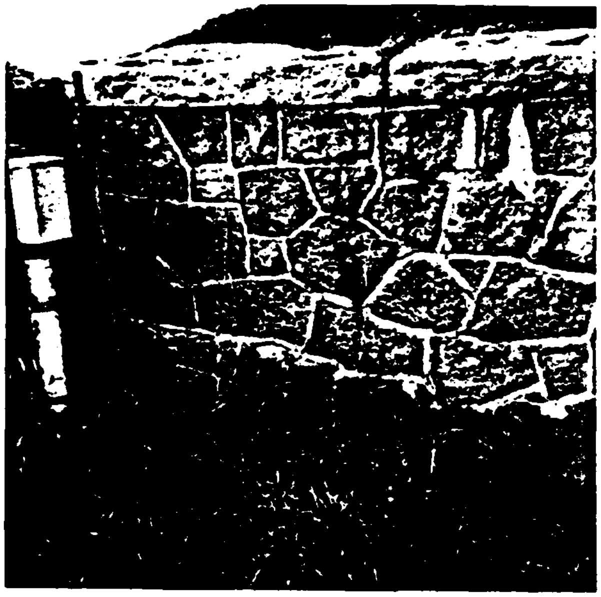
#13 Diversion works outlet channel

#14 Diversion stream overgrown

#15 Diversion stream overgrown at culverts

#16 Shoreline on East end of Dam

#17 Area between East parking lot and fence



#18 Cracks on East Side of causeway wall.

#19 Seepage condition downstear of Saville in Compensating Reservoir.

 DATE Oct 18, 1974

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply FACILITY Dam

NAME OF FACILITY Saville Dam Fountain Pool

LOCATION Barkhamsted, Ct

INSPECTORS: NAME	TITLE	DIVISION/DEPT.
P. J. Revill	Ch. Des. Engr	Design
R. E. Covaspach	Sr. Engr	"

CONDITION OF FACILITY:

Pool in general is OK - Small amount of sludge & stones on floor.
Pipe supports in pool for fountain supply piping deteriorated
Tie down straps for mill owners discharge nozzle are loose.
Sump of Bills Brook culvert full of sand, etc.
Large boulders accumulated in outfall channel.
Minor pointing of stonework around pool needed.

WORK SUGGESTED BY OPERATING AUTHORITY:

RECOMMENDATIONS:

General clean up of pool, outfall channel and Bills Brook sump. Renovate concrete pipe support piers and replace tie down straps on millowners discharge nozzle

20 April 1976

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply FACILITY Dam

NAME OF FACILITY Saville Dam

LOCATION West intake well only

INSPECTORS: NAME	TITLE	DIVISION/DEPT.
P. J. Revill	Ch. Des. Engr.	Designing

CONDITION OF FACILITY:

Concrete : excellent

Cast iron guide slots : heavily tuberculated

Ladder : appears sound, rusty & tuberculated

Steel channels - stem guide supports spanning across well : good, some rust & tuberculation.

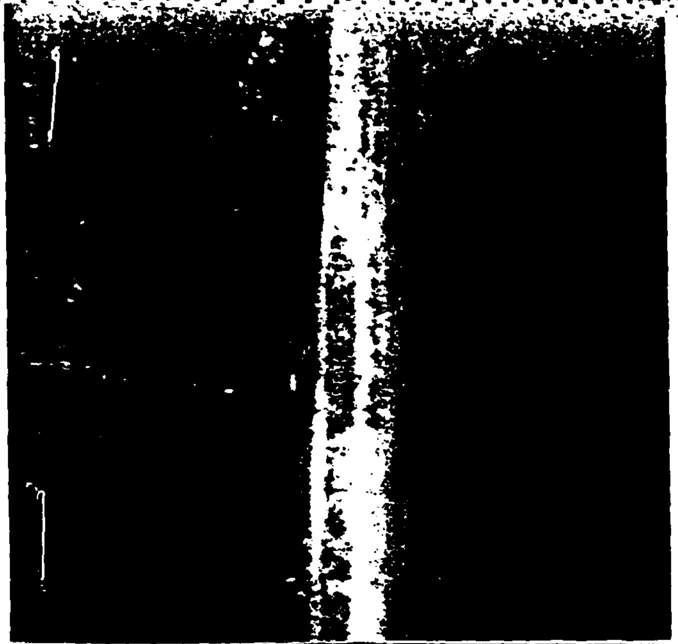
Sluice gates & appurtenances : good, some rust & tuberculations. 96"×48" gate leaking, top & right side.

WORK SUGGESTED BY OPERATING AUTHORITY:

RECOMMENDATIONS:

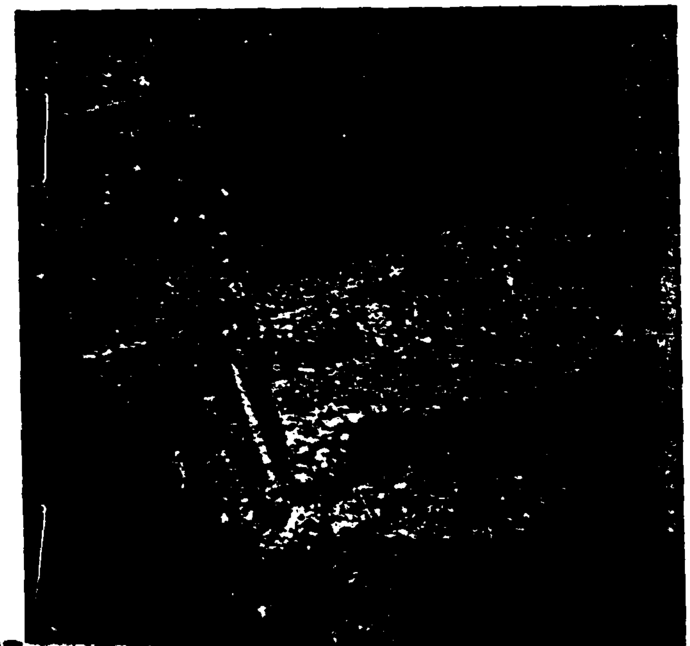
Take no maintenance action as condition reasonably good. Re inspect in 5 yrs. Do not operate 96"×48" gate.

See report in Misc Reports 5-1401, 20 April 1976



Crossbeam
Stem bracket
Stem.

Sluice gate #5 (96"x48")
leaking



Typical sluice
gate condition

DESIGNING DIVISION

August 6, 1976

Page 1

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply **FACILITY** Dam

NAME OF FACILITY Saville Dam

~~LOCATION~~ Spillway weir and adjacent channel only (From Route 318 bridge north to spillway weir) Barkhamsted

INSPECTORS:

NAME	TITLE	DIVISION/DEPT.
C.A. Garritt	Asst. Ch. Des. Engr.	Designing
I.A. Hart	Superintendent	Supply

CONDITION OF FACILITY: (See attached photos)

General condition of spillway weir and adjacent channel is good. In the past mortar between the joints has been replaced with a flexible filler. Some of this filler is not bonding to the mortar, because the mortar is deteriorated. The mortar in other joints not covered with a flexible filler is also deteriorated to a depth of 1 to 2 inches The same problem is occurring to the mortared joints in the channel bed. (See page

WORK SUGGESTED BY OPERATING AUTHORITY:

Supply division would like to see repairs made by contract - too extensive to be accomplished by division forces.

RECOMMENDATIONS:

Rake and repoint all mortar joints that are in bad condition. Filler material should be determined after a brief study of available products. Clean all granite facing preferably by sandblasting to remove leached lime etc.

SEE PHOTOS OVER

DATE August 2, 1976

Page 2

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM ______ FACILITY ______

NAME OF FACILITY ______

LOCATION ______

INSPECTORS:

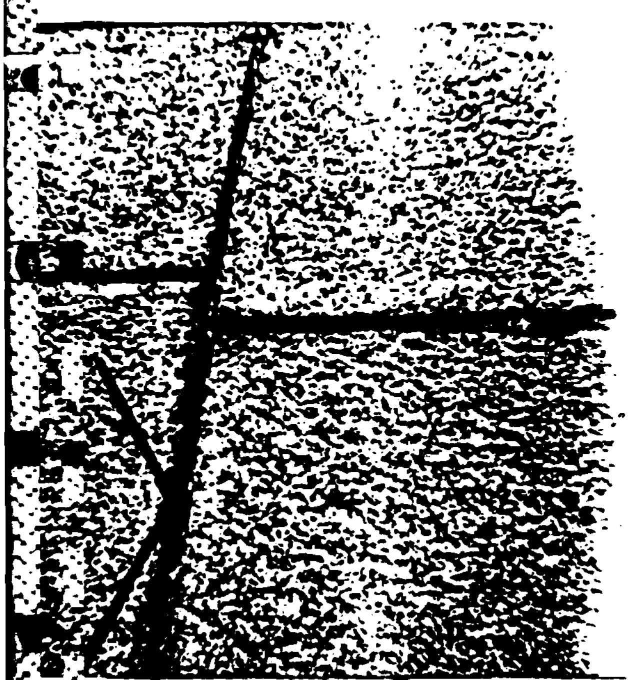
NAME	TITLE	DIVISION/DEPT.

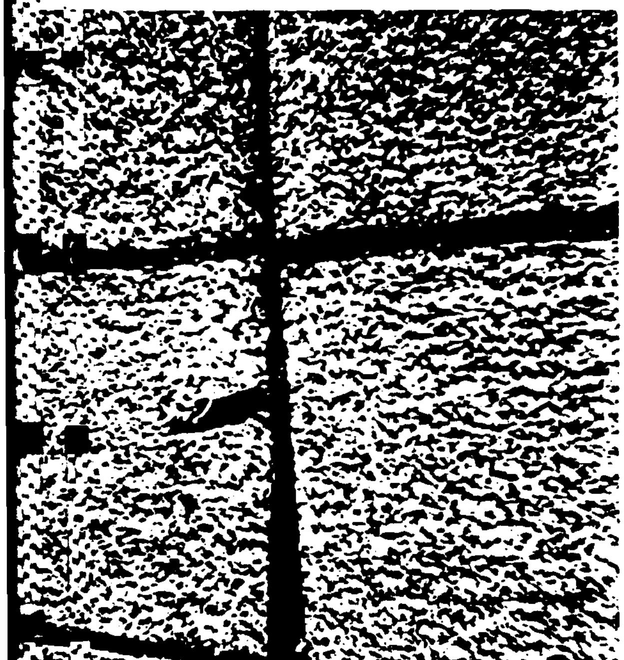
CONDITION OF FACILITY: Cont.

Some of the mortar joints on the retaining wall north of the weir are in bad condition (deteriooted mortar to a depth of about 2 inches). On the west wall of the channel the mortor needs to be replaced in the horizontal joint below the cap stone. (between bridge and spillway weir). Lime has leached from the mortar on to the granite facing of east & west channel walls as well as the bridge walls. The spillway weir and channel bed are in no danger of unraveling because of the above stated condition.

WORK SUGGESTED BY OPERATING AUTHORITY:

RECOMMENDATIONS:





WATER BUREAU
DESIGNING DIVISION

DATE 16 November 1976

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply FACILITY Dam

NAME OF FACILITY Saville Dam

~~LOCATION~~ Center well sluice gate ("Millowner's outlet)

INSPECTORS:	NAME	TITLE	DIVISION/DEPT.
	P. J. Revill	Ch. Des. Engr.	Designing
	—	Assistant in maintenance crew	

CONDITION OF FACILITY:

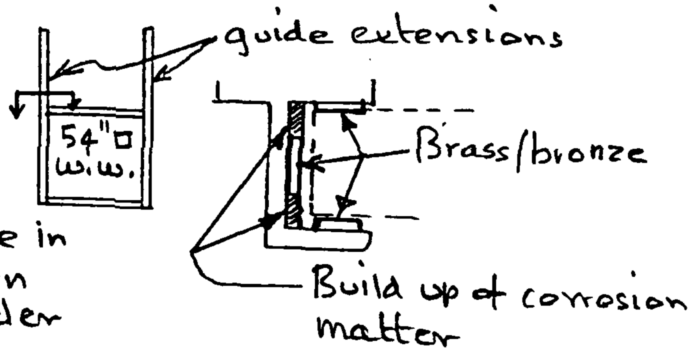
Entire unit - sluice gate, stem, operator - appear in excellent condition. Bronze seating strips on gate slightly scored. Side guide strips on guide extensions surrounded with rust + tuberculations which might cause some irregularity noted in operation.* Piping downstream in good condition, no noticeable cavitation. Some cement lining (1 sq ft -) missing from invert of steel pipe.

~~**WORK SUGGESTED BY OPERATING AUTHORITY:**~~

RECOMMENDATIONS:

Clean up guide ext. grooves. Lubricate with waterproof grease. Operate in the dry several times, then submerge & operate under pressure. Report any troubles to PJR.

*



Ref: see Contract 22 shop folder for 54"x54" sluice gate.

Attachment ✓ (None), Pictures (Number)

over

WATER BUREAU
DESIGNING DIVISION

DATE 24 June 1977

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply FACILITY Dam

NAME OF FACILITY Saville Dam - Weir & channel

LOCATION

INSPECTORS:	NAME	TITLE	DIVISION/DEPT.
	C. A. Garritt	Ass. Ch. Des. Engr	Designing Div
	R. E. Conopask	Senior Engr.	"
	P. J. Revill	Ch. Des. Engr.	"

CONDITION OF FACILITY: (Water 1" below spill)

Weir. Surface topography good - no major displacement. However 20'± length of upstream veneer seems to have moved upstream 1/8"±. Several longitudinal joints open. Water coming through weir, some parts of weir wet. One small squirting leak.

Basin - Weir to bridge. Walls stained with lime etc, some poor joints near top, but generally good. Floor paving - a good deal of the joint pointing (1"±) missing. Most of bedding mortar seems sound, but some is missing leaving cavities under pointing here & there. 2 or 3 bushes / plants growing out of joints.

Channel - Upst. face of bridge to end of stone paving. Conditions observed in basin much accentuated. Many cases of missing mortar, and

~~WORK SUGGESTED BY OPERATING AUTHORITY:~~

Several smaller stones have been washed out. Walls in good condition some mortar missing.

End of channel @ pool. Much of pointing mortar in original work missing, but bedding mortar sound, except in a few cases. New work (1955+) in good condition.

RECOMMENDATIONS:

Weir Caulk all open joints with Thiokol or equal sealant. When resvr. is low, fill in any openings between weir masonry & upstream apron paving to control leakage.

Channel & walls Where damage scattered, repair with W.B. personnel. Where damage extensive, repair by contract. Suggest repointing of paving 2"-3" deep to avoid washout.

Attachment ✓ (None), ______ (Number)

Photos over.

WATER BUREAU
DESIGNING DIVISION

DATE 10 April 1978

INSPECTION OF WATER BUREAU FACILITIES

SYSTEM Supply FACILITY Dam

NAME OF FACILITY Saville Dam

~~LOCATION~~ Upper Intake & East Well

	NAME	TITLE	DIVISION/DEPT.
INSPECTORS:	P.J. Revill	Ch. Des. Engr.	Designing
	Also operating personnel independently.		

CONDITION OF FACILITY:

Upper Intake Stone masonry Top stones displaced, joints open. Concrete of well excellent where visible. Selector gates Panels tuberculated but seem sound. Chains & weights in good condition, (chains said to have been renewed during previous inspection in the 1960's). Ladder Fairly good, heavily tuberculated (rust encrusted) especially near bottom.

East Well. Concrete - excellent. C.I slots - heavily tuberculated. Sluice gates - too much water for inspection. Stems, guides appear fine. Embedded channels supporting guides in excellent condition. Ladder excellent except near bottom where heavily rusted.

~~WORK SUGGESTED BY OPERATING AUTHORITY~~: Note that paint put on in 1968 on channels & ladder etc in supprisingly good condition. Paint was Sherwin-Williams Chemical & Moisture resistant enamel & primer.

RECOMMENDATIONS:

Inspect in 5 yrs.
Also - repair or rebuild stone masonry before long.
- clean & paint selector gates within the next 2-3 yrs.

Attachment Photos (Intake well only) (None), ______ (Number)

FORM 38 2/REC/ss S-1401

METROPOLITAN DISTRICT
HARTFORD COUNTY, CONNECTICUT

From: R. E. Conopask, Senior Engineer Date: February 1, 1977

To: P. J. Revill, Chief Designing Engineer Copy to: REC

SUBJECT: Inspection of dehumidification results in Lower Gate House, Pipe Gallery, Stairwell and Upper Gate House - Saville Dam File:

Basically, about 80% of the problems associated with humidity have been eliminated by the present heating system; however a few wet areas could possibly be dried by heat. The following suggestions for were offered by Ed Sullivan and Tony Failla:

1. Remove large unit heaters in operating floor area of Lower Gate House and replace with the smaller ones now on the second level. Put cast iron radiators (used) in lowest level of Gate House to dry up this level better.

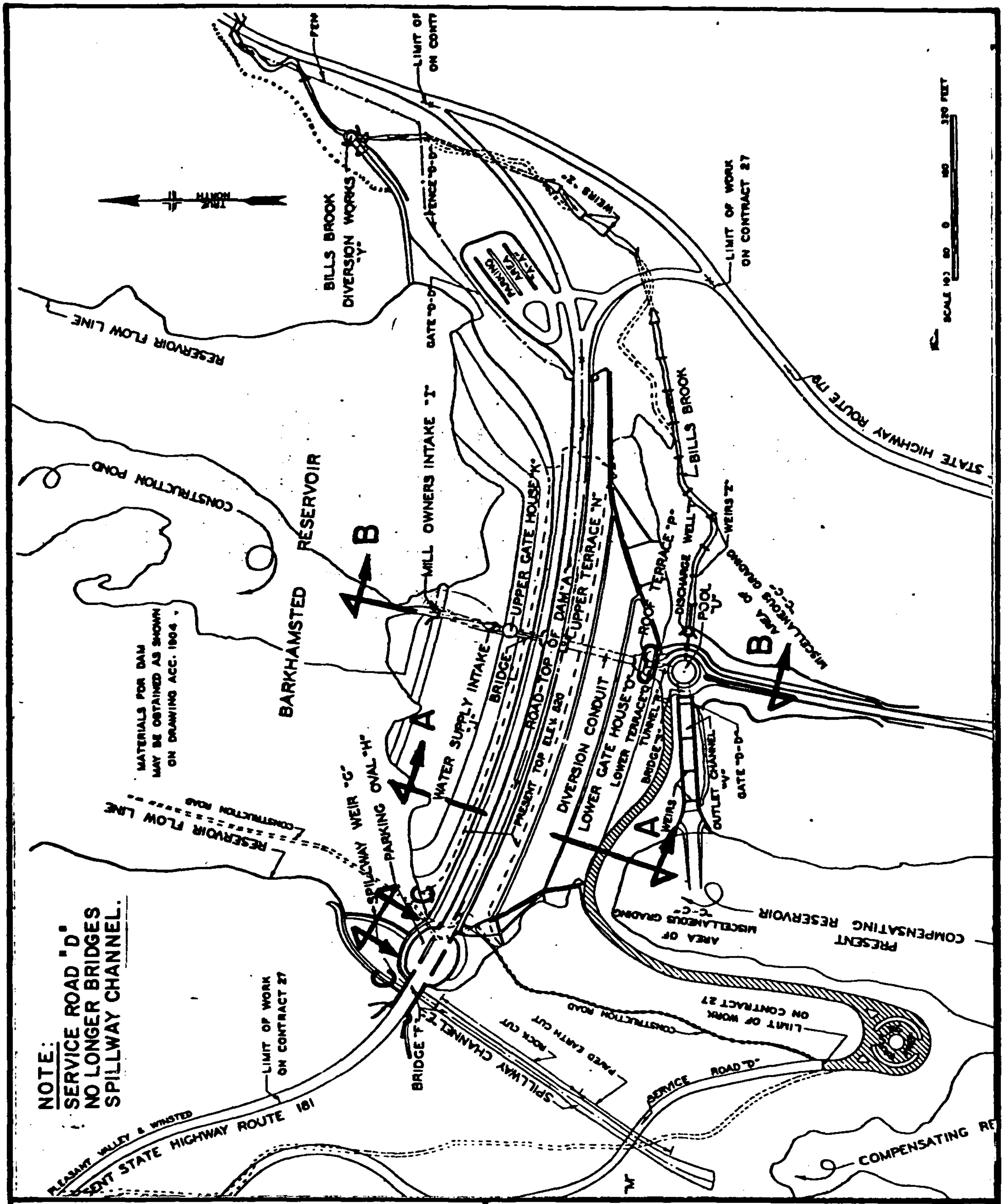
2. West and East walls of the stairwell from the bottom to an elevation about 2 levels above the diesel cooling pump still drip. Add more fin tube heaters from bottom up as necessary to attempt to dry up weepage. Use present tees in upper Gate House Zone to supply heat.

3. Add (2) fin tube heaters in north end of pipe gallery against east and west walls at bottom of spiral stairway to attempt to dry the gallery roof.

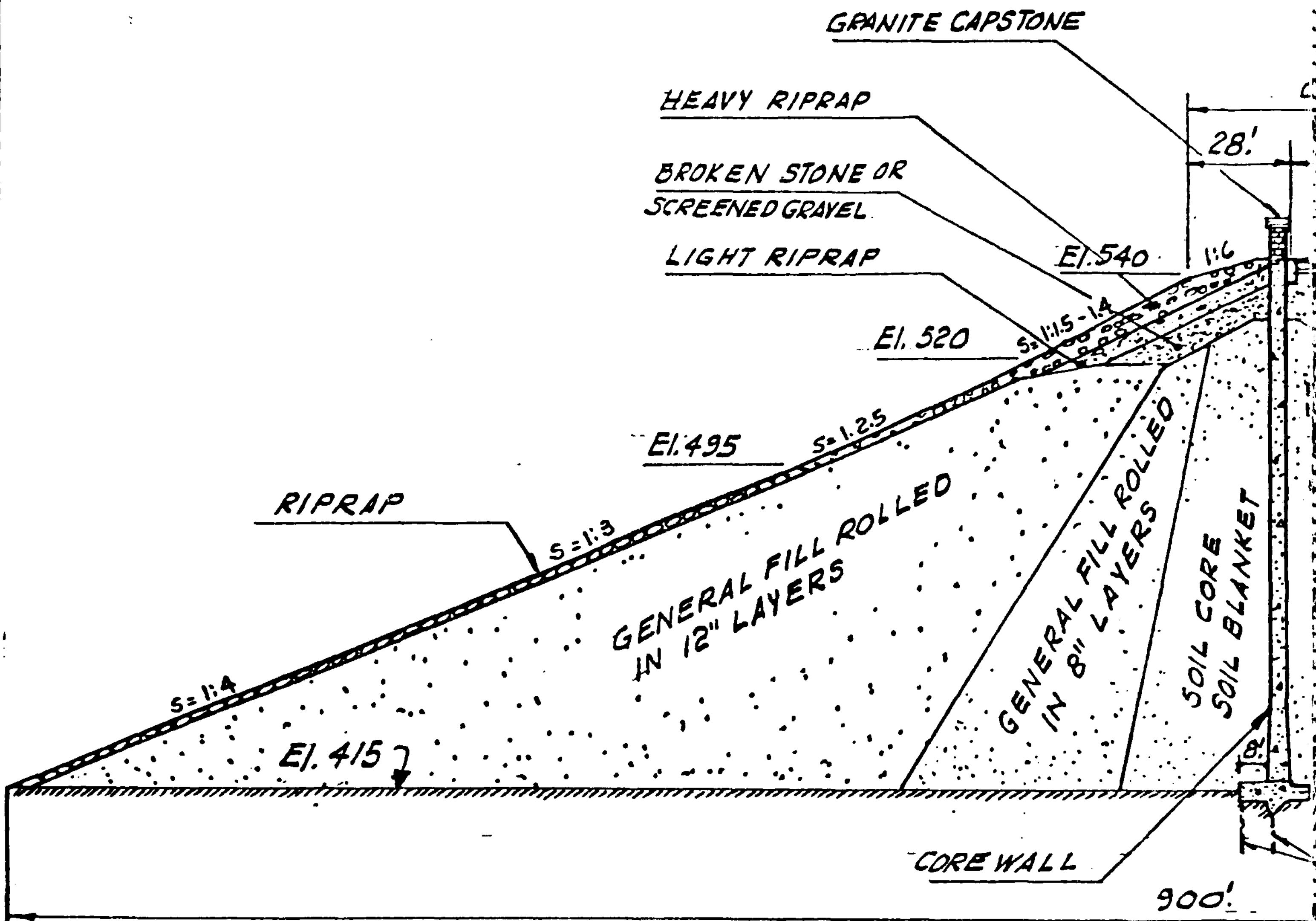
The operating personnel would like guidelines for operating the exhaust fan to obtain optimum moisture removal for each gallon of fuel burned.

The operating personnel also want to eliminate the "re-corking" of the pipes in the gallery and instead paint them as the deteriorated cork is removed and rely on the dehumidification system to prevent condensation on the pipes.

Richard E. Conopask



U.S. ARMY, CORP OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASS.	SAVILLE DAM GENERAL PLAN	PLATE-1

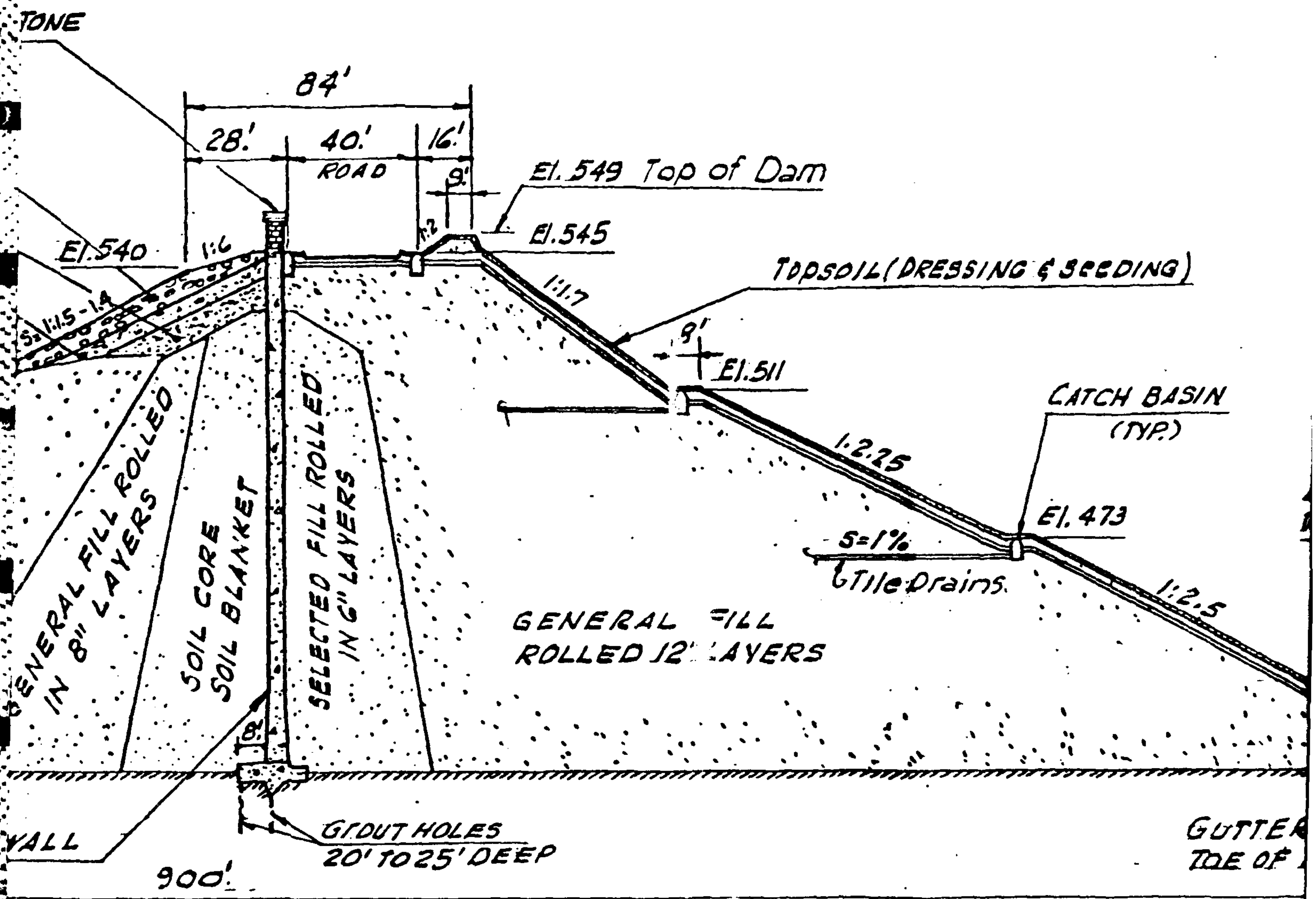


SECTIO

Not to S

NOTE: INFORMATION TAKEN FROM DRAWINGS SUPPLIED BY THE METROPOLITAN DISTRICT COMMISSION OF HARTFORD.

(1)



SECTION A-A

Not to Scale

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARM
NATIONAL PROGRAM OF INSPECTIO	
SAVILLE DA	
FARMINGTON RIVER	
	SCALE:
	DATE

LIED
ON

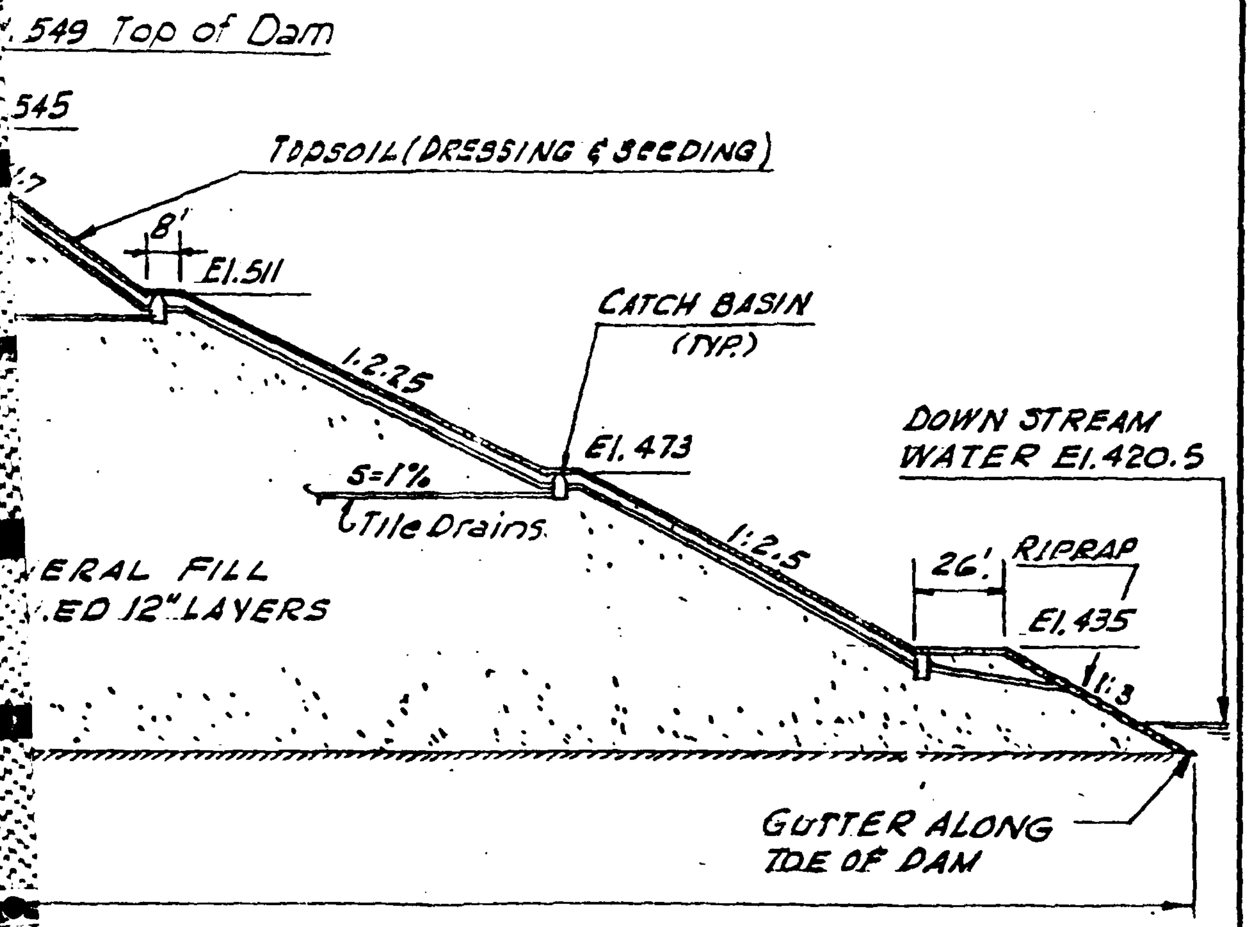


PLATE-2

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

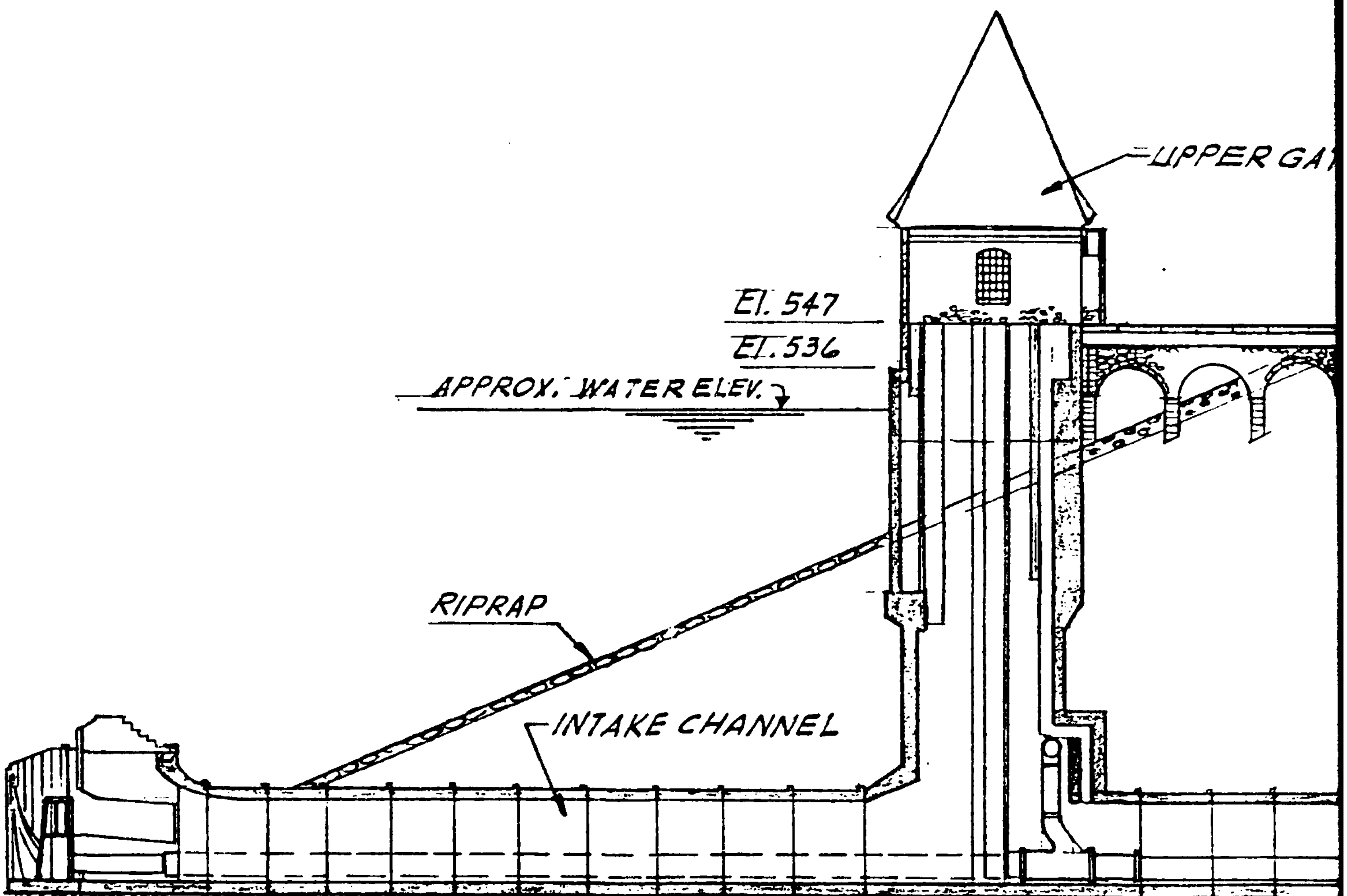
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SAVILLE DAM

FARMINGTON RIVER CONNECTICUT

SCALE: AS SHOWN

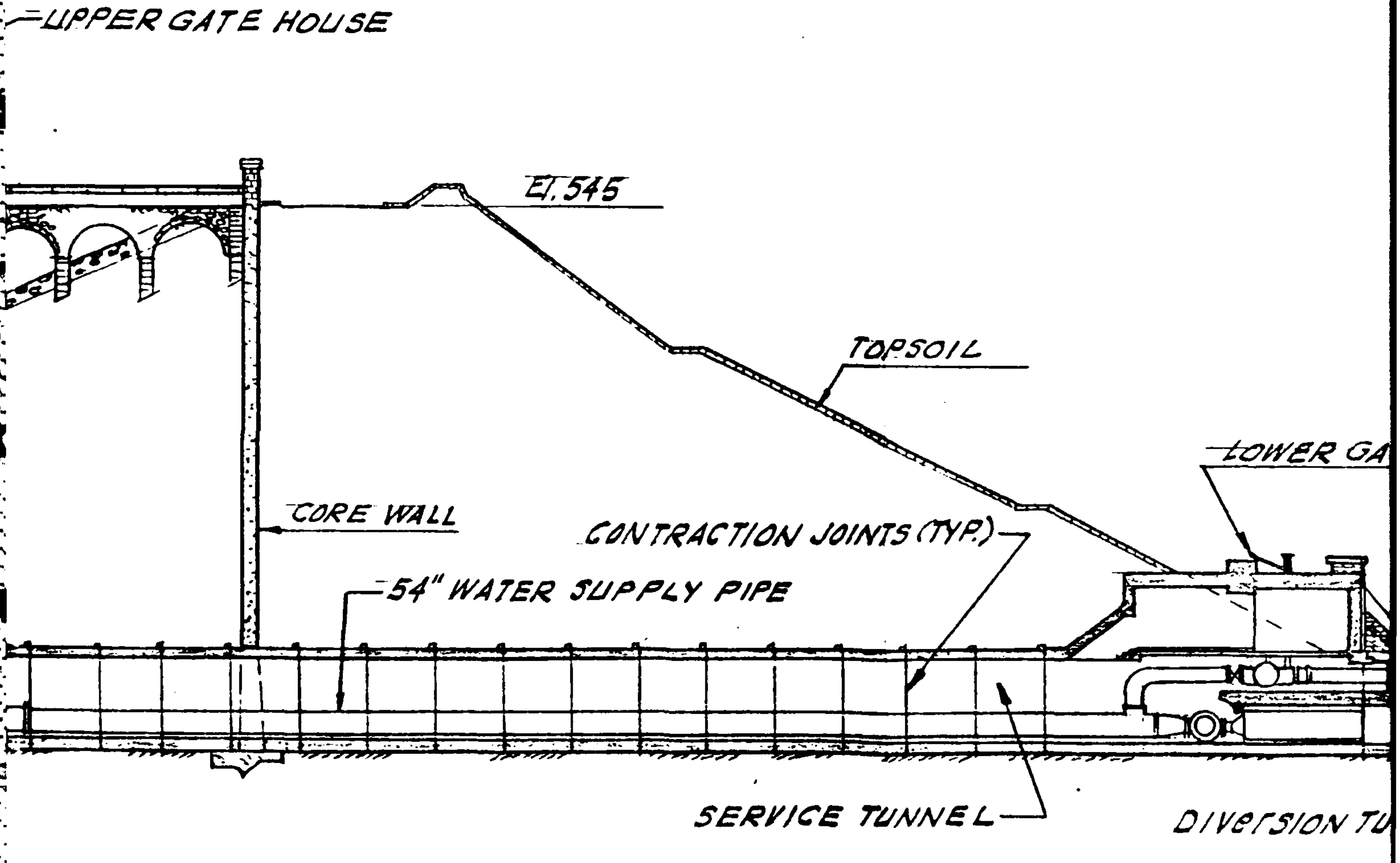
3



SECT

Not

NOTE: INFORMATION TAKEN FROM DRAWINGS SUPPLIED BY THE METROPOLITAN DISTRICT COMMISSION OF HARTFORD.



SECTION B-B

Not to Scale

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINE CORPS OF WALTHA

NATIONAL PROGRAM OF INSPECTION OF N

SAVILLE DAM

FARMINGTON RIVER C

SCALE: AS SHO

DATE: SEPTEM

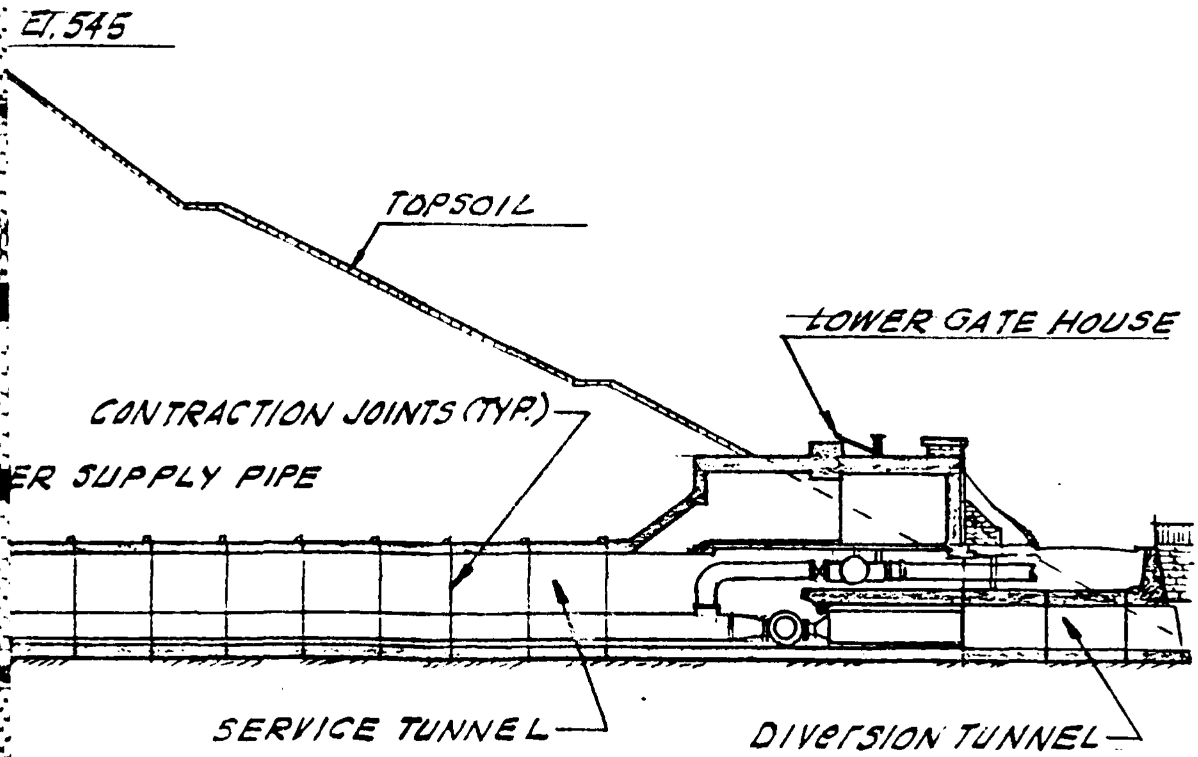


PLATE-3

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

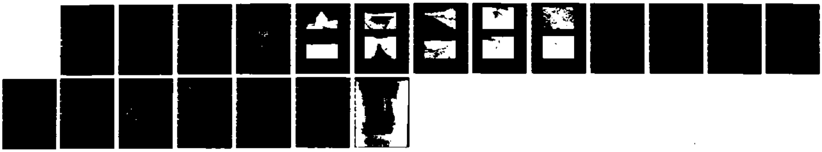
SAVILLE DAM

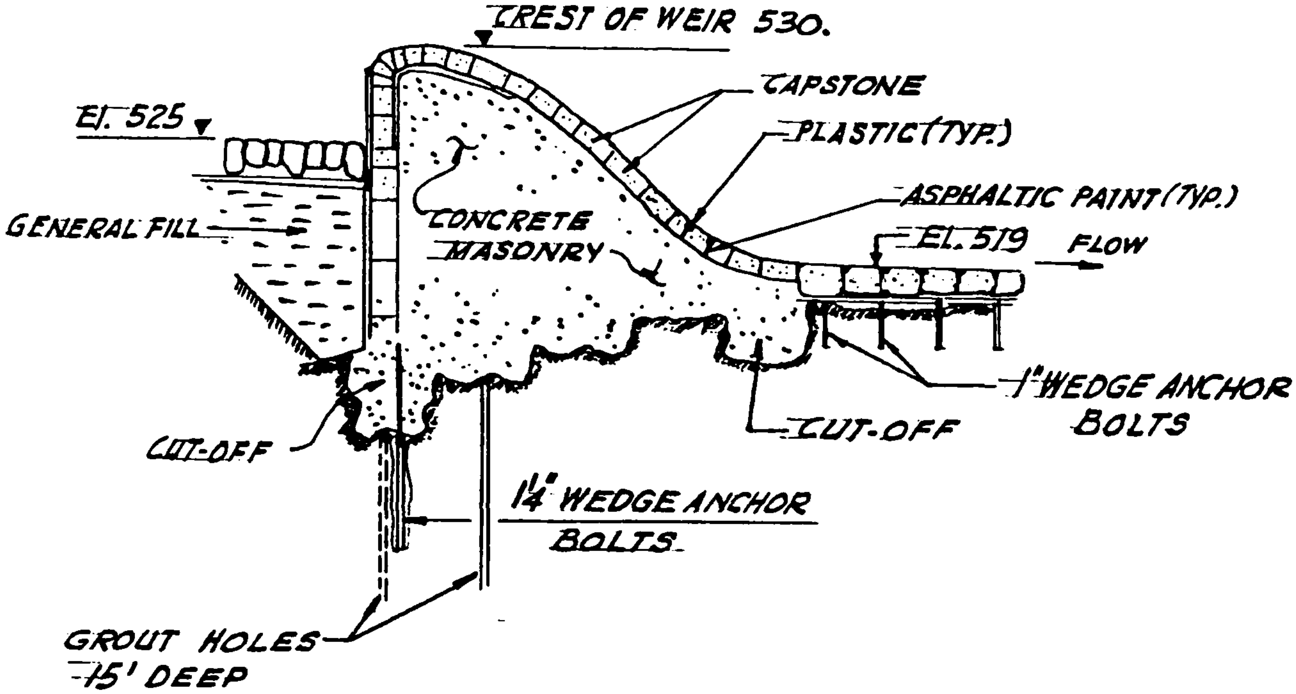
FARMINGTON RIVER CONNECTICUT

SCALE: AS SHOWN

AD-A144 060 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SAVILLE DAM (CT 00376..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV SEP 78 2/2

UNCLASSIFIED F/G 13/13 NL





SECTION C-C

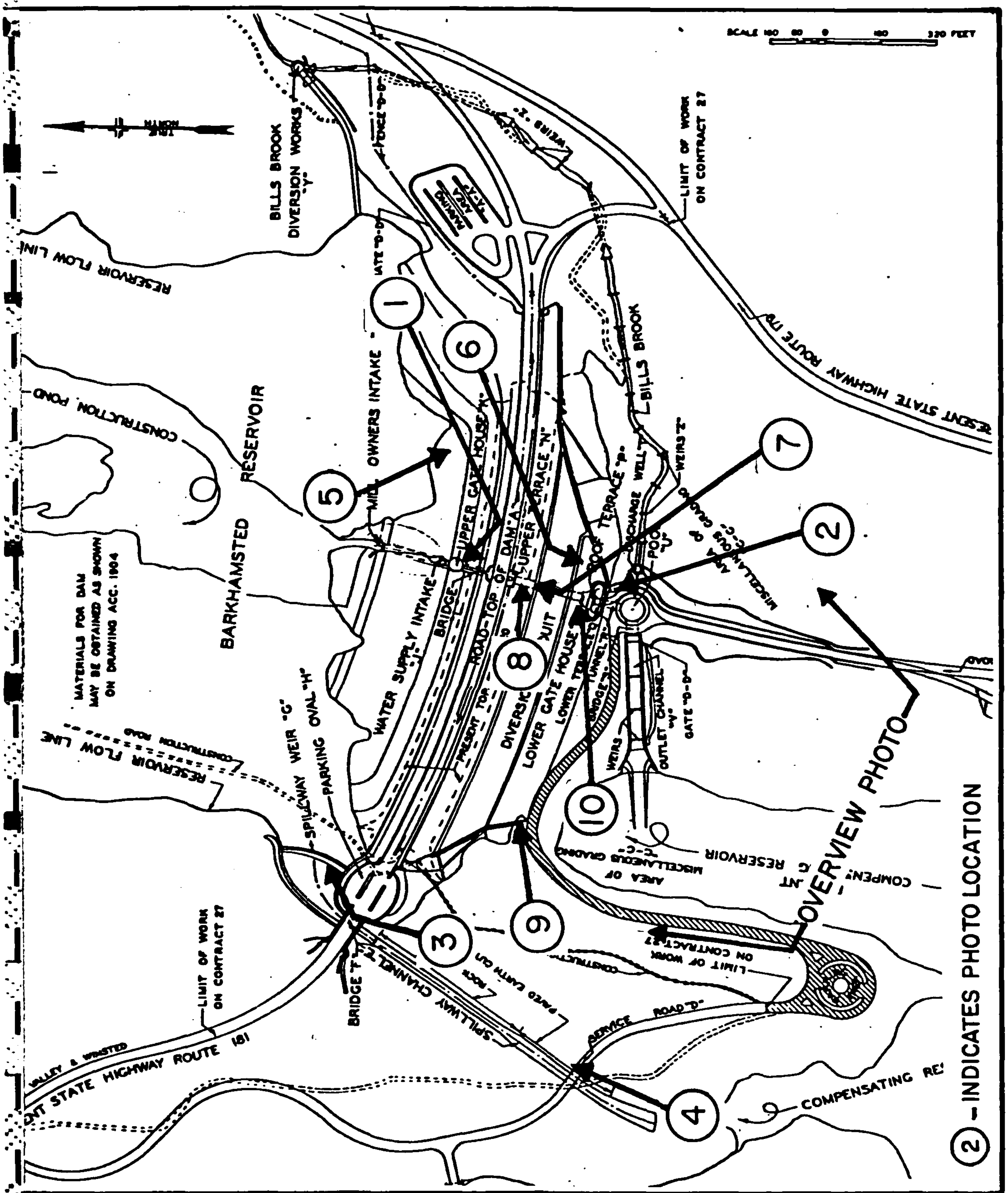
Not to Scale

NOTE: INFORMATION TAKEN FROM DRAWINGS SUPPLIED BY THE METROPOLITAN DISTRICT COMMISSION OF HARTFORD.

U.S. ARMY, CORP OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASS.	SAVILLE DAM SECTION AND DETAILS	PLATE 4

APPENDIX C

PHOTO LOCATION PLAN	Plate 5
PHOTOGRAPHS	II-1 to II-5



U.S.ARMY,CORP OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASS.	SAVILLE DAM PHOTO LOCATION PLAN	PLATE-5

PHOTO 1

UPPER GATE HOUSE

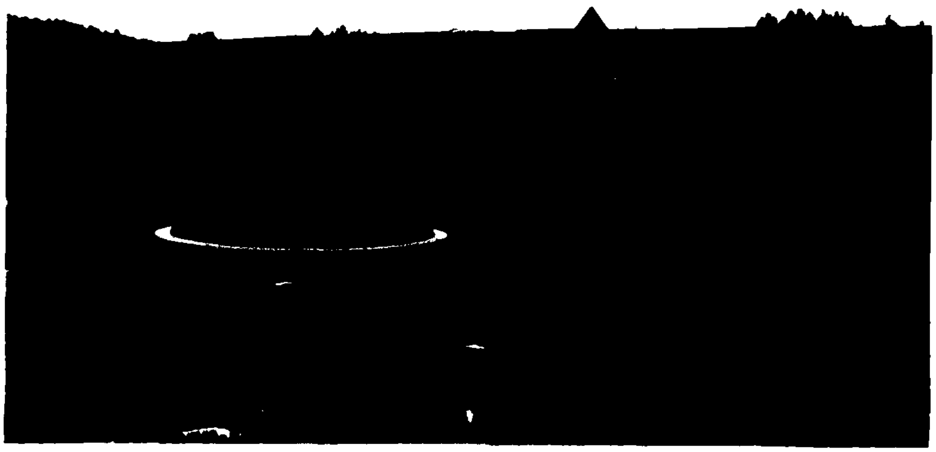


PHOTO 2

LOWER GATE HOUSE AND FACE OF DAM

PHOTO 3

SPILLWAY WEIR

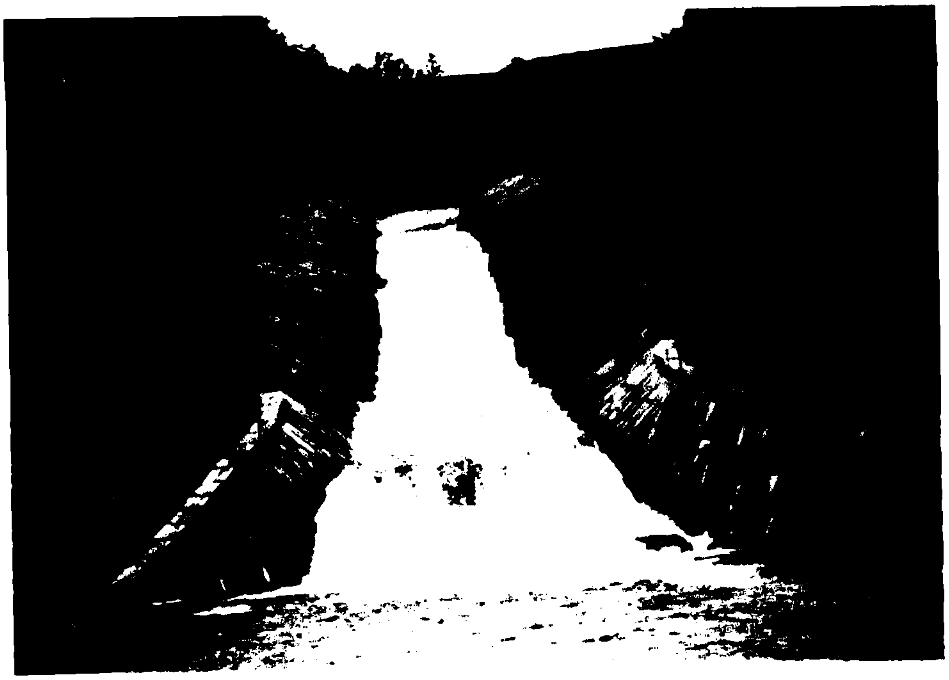


PHOTO 4

SPILLWAY CHANNEL AND SERVICE BRIDGE

PHOTO 5

UPSTREAM FACE OF DAM

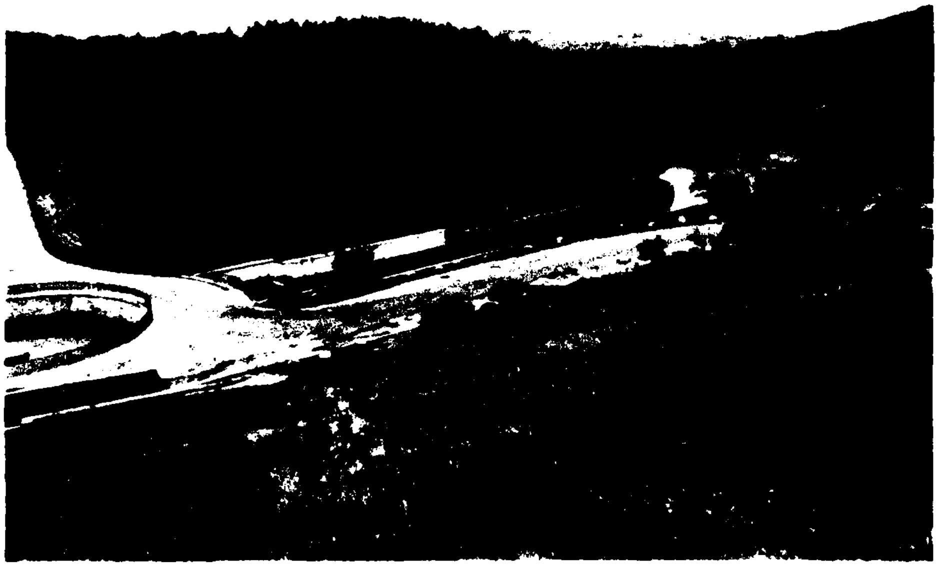


PHOTO 6

DIVERSION TUNNEL OUTLET CHANNEL

PHOTO 7

SERVICE TUNNEL

(LOOKING TOWARD LOWER GATE HOUSE)

PHOTO 8

SERVICE TUNNEL - CONSTRUCTION JOINT

PHOTO 9

OUTLET OF SURFACE AND UNDERDRAIN NETWORK

PHOTO 10

PIPE COLLECTING FLOW FROM SPRING NEAR LOWER GATE HOUSE

APPENDIX D

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

"RULE of THUMB" Guidance for estimating downstream dam failure hydrographs

Section 2000 ft Downstream from Rte 179, Collinsville

① $S = 168424$ Ac-ft ⟶ 182,292 Ac-ft (Barkhamsted & Compensating)
② $Q_{p_1} = 2071929$ cfs (Barkhamsted & Compensating)
③ see stage dischage sheet 2 of 2
④ A. $D_1 = 74'$, $A_1 = 72{,}000$ ft^2
$L_1 = 30{,}000'$
$V_1 = 49{,}590$ Ac-ft
B. $Q_{p_2} = Q_{p_1}(1 - V_{AV}/S) = 2{,}071{,}929(1 - 49590/182292) = 1{,}508{,}28?$ cfs
C. $D_2 = 63'$ $A_2 = 55{,}000$ ft^2
D. $A_{avg} = 63{,}500$ ft^2 $V_2 = 43{,}730$
$Q_{p_2} = Q_{p_1}(1 - V_{AV}/S) = 2{,}071{,}929(1 - 43730/182292) = 1{,}575{,}000$

$D_2 = 64'$

II Section @ New York, New Haven & Hartford RR Bridge (Farmin...

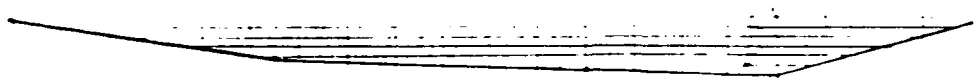
④ A. $D_2 = 64'$ $A = 58{,}000$ ft^2
$L_2 = 30{,}000'$
$V_2 = 39{,}945$ Ac-ft
B. $Q_{p_3} = Q_{p_2}(1 - V_2/S) = 1{,}575{,}000(1 - 39945/138{,}502) = 1{,}120{,}950$ cfs
C. $D_3 = 54'$ $A_3 = 43{,}500$ ft^2
D. $A_{AVG} = 50{,}750$ ft^2 $V_3 = 34{,}950$ Ac-ft
$Q_{p_3} = Q_{p_2}(1 - V_2/S) = 1{,}575{,}000(1 - 34950/138502) = 1{,}177{,}73?$

$D_3 = 55'$

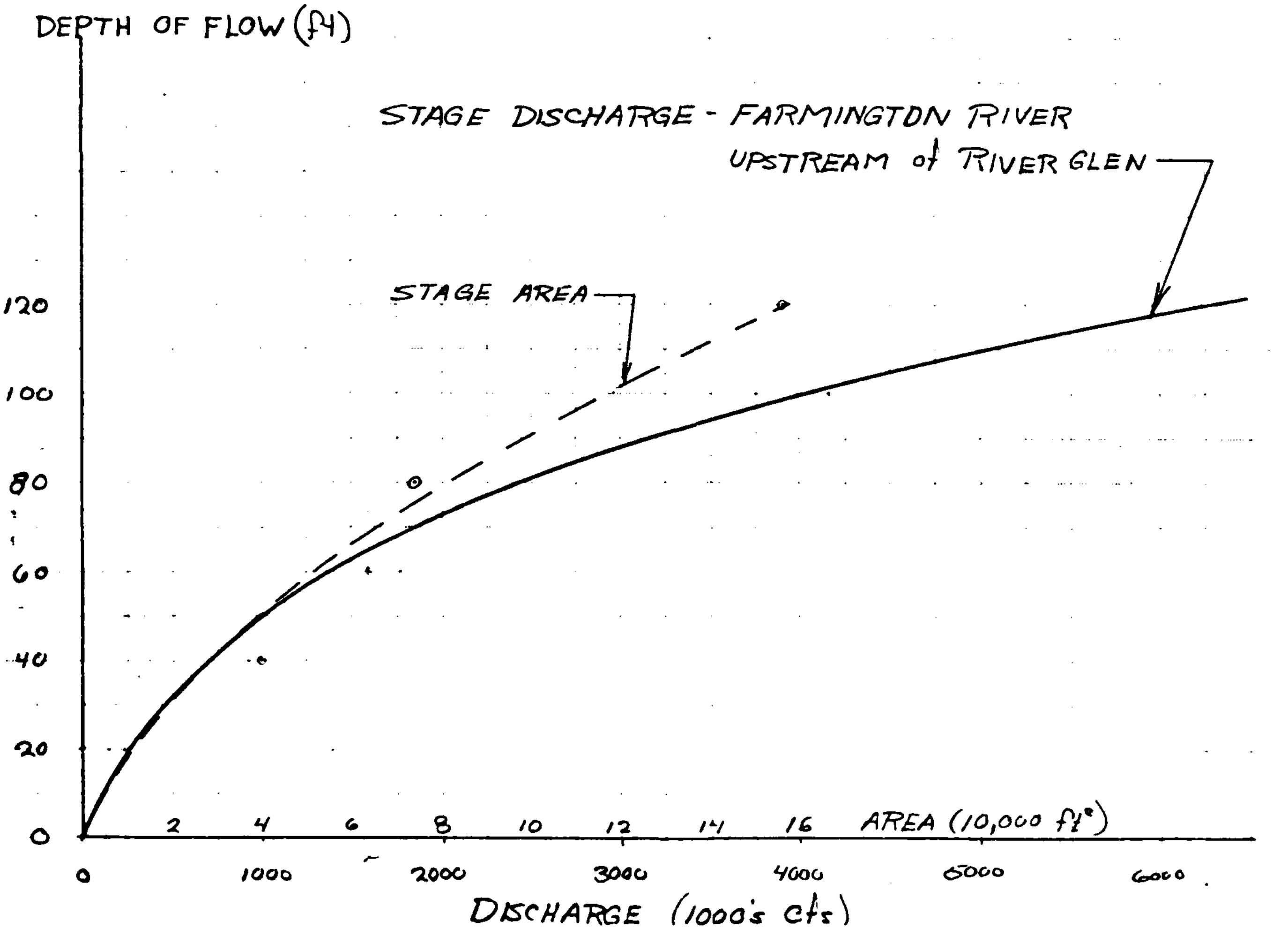
TYPICAL SECTION- FARMINGTON RIVER

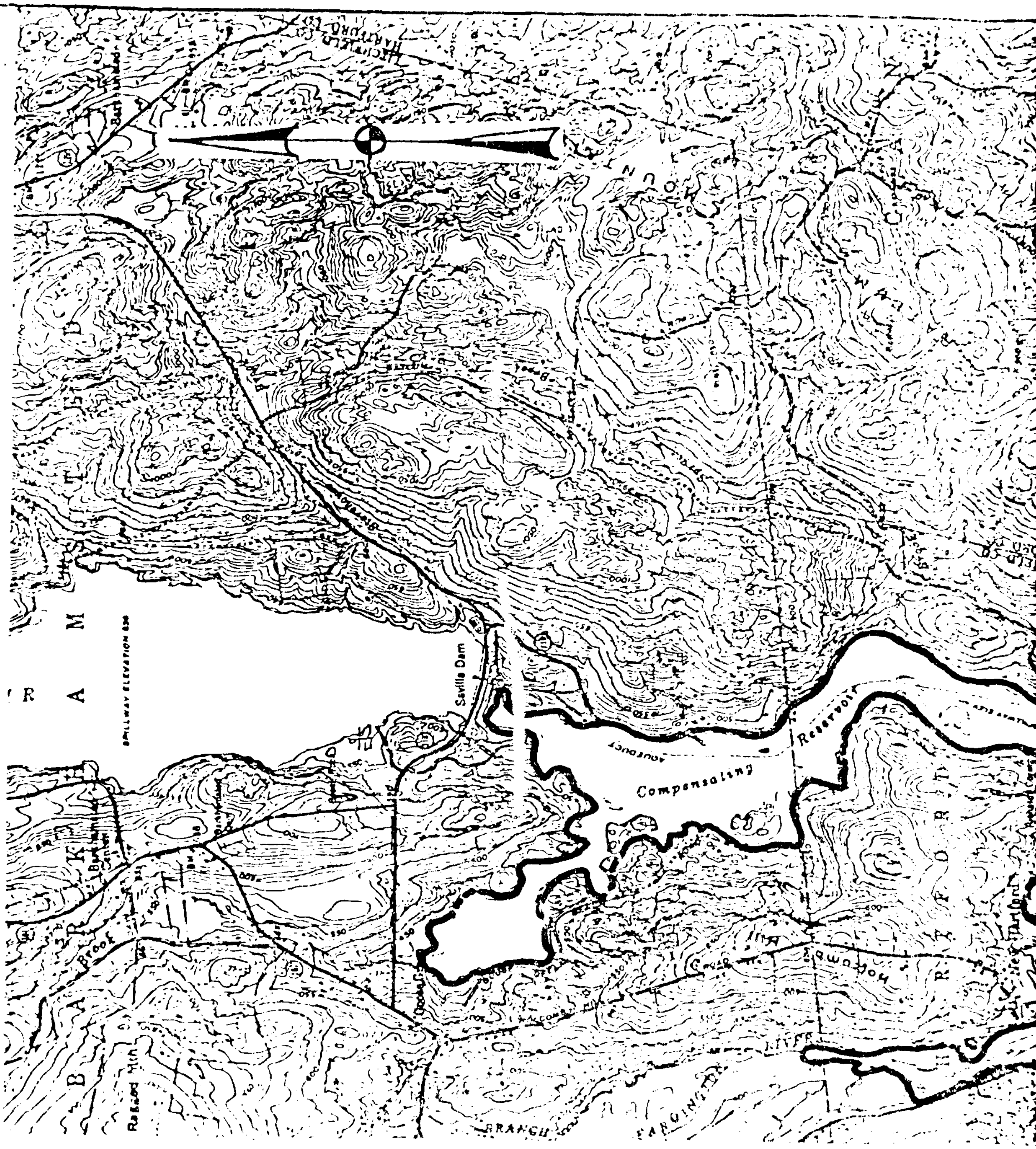
$V = \frac{1.486}{n} R^{2/3} S^{1/2}$

S = .0028
n = .035 (avg)



D_{ft}	$W_{P_{ft}}$	A_{ft^2}	R	$R^{2/3}$	$S^{1/2}$	V_{fps}	Q_{cfs}
20	590	9600	16.27	6.43	.0527	14.4	138,240
40	1230	40,000	32.52	10.2	.0527	22.8	912,000
60	1480	64000	43.24	12.33	.0527	27.62	1 7,680
80	1670	73600	44.08	12.49	.0527	27.93	59,151
100	1890	118,400	62.65	15.79	.0527	35.37	187,760
120	2100	156,800	74.67	17.75	.0527	39.76	41,368





LEGEND

DENOTES LIMITS OF FLOODING IN CASE OF DAM FAILURE

SCALE 1:24000

CONTOUR INTERVAL 10 FEET

DATUM IS MEAN SEA LEVEL

SCALE 1:24000

1 MILE

2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S ARMY ENGINE CORPS O WALTH

NATIONAL PROGRAM OF INSPECTION OF N

SAVILLE DAM

FARMINGTON RIVER

SCALE: AS

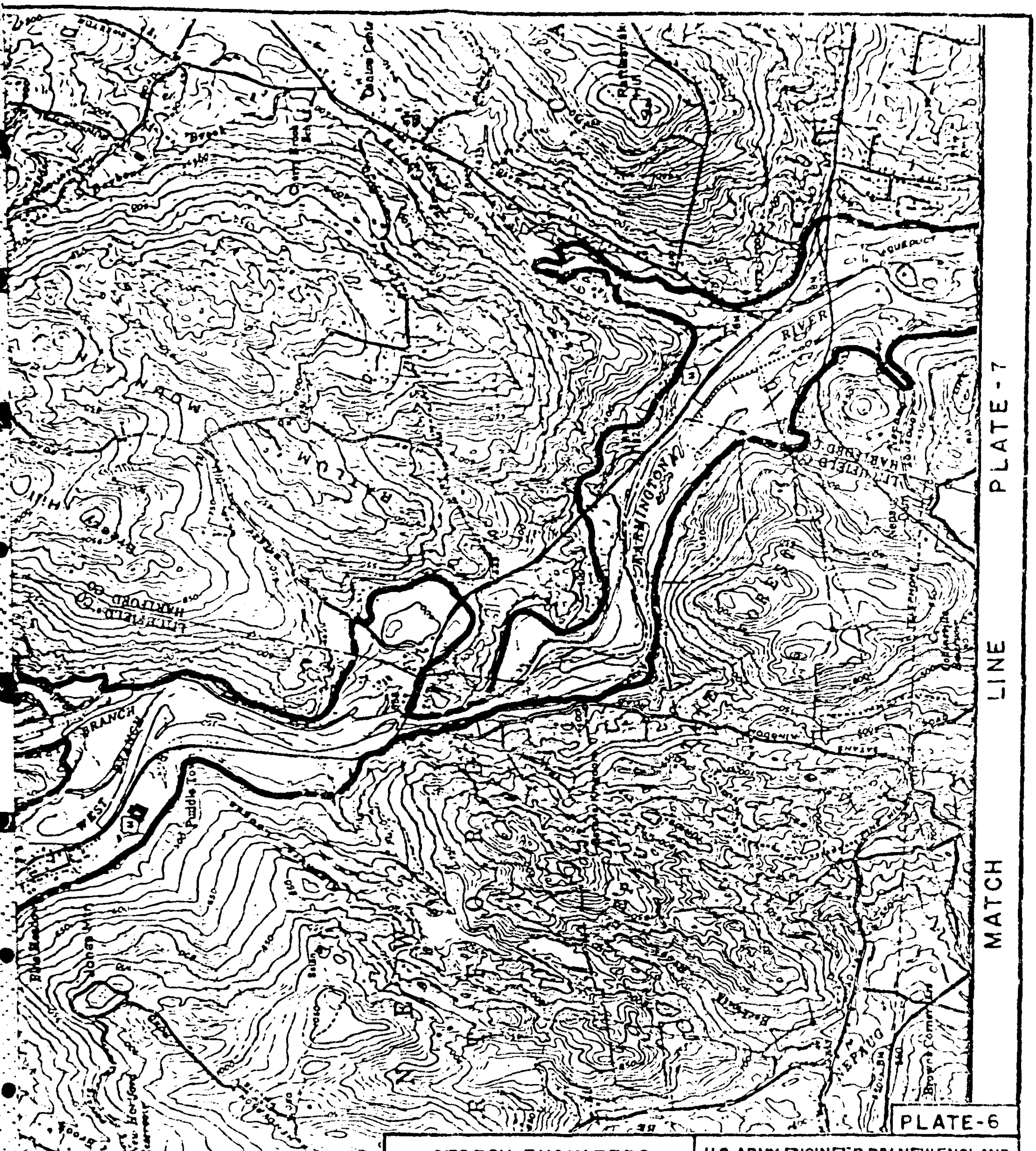


PLATE-6

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

SAVILLE DAM

FARMINGTON RIVER CONNECTICUT

SCALE: AS SHOWN

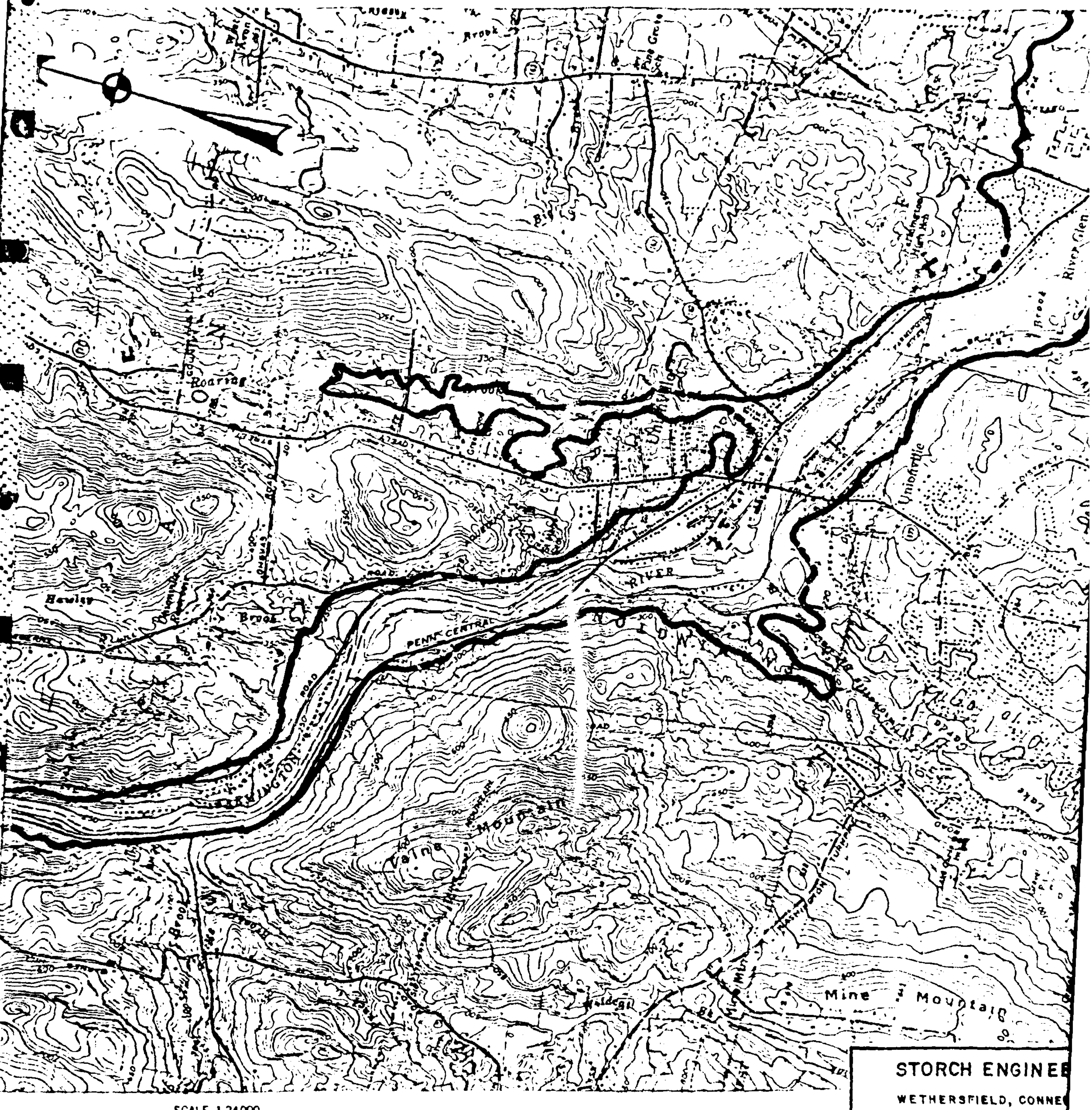
DATE

SCALE 1:24000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

LEGEND

DENOTES LIMITS OF FLOODING IN CASE OF DAM FAILURE



SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET

DATUM IS MEAN SEA LEVEL

STORCH ENGINEE

WETHERSFIELD, CONNE

NATIONAL PROGRA

SA

FARMINGTON RIV

PLATE-7

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SAVILLE DAM

FARMINGTON RIVER CONNECTICUT

SCALE: AS SHOWN

APPENDIX E

INVENTORY FORMS

END

FILMED

DTIC